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Keys for the Pollen of Ashiu, Central Japan

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ABSTRACT The keys for the pollen flora of the research forest of Kyoto University in Ashiu, Kyoto, Central Japan are provided with information on the flowering season. Of 123 families 793 species distributed in the area, 550 species of all the families are treated in the keys. The pollen morphology of 248 species are described in detail on the basis of the materials collected from Ashiu or near places.

KEY WORDS Pollen morphology/key/flowering season/Kyoto/Japan

Introduction

Pollen analysis is not only the most important methods for reconstruction of past flora, vegetation and environment, but also an useful research tool for pollination biology and food utilization of animals visiting flowers (Kearns and Inouye, 1993). Among such animals visiting flowers, bees are the predominant pollinators. Bees collect pollen grains and nectar from flowers and pollinate the plants. This bee-plant relationship can be investigated by analyzing the pollen grains on the body of bees, in the nest, and in honey (O'Rourke and Buchmann, 1991). The use of pollen is surveyed by applying these methods, in honeybees (Synge, 1947; Severson and Parry, 1981; Pearson and Braiden, 1990), bumblebees (Brian, 1951; Ranta and Lundberg, 1981), stingless bees (Roubik et al., 1986), and solitary bees (Cripps and Rust, 1989).

For quick identification of pollen grains to the lower taxonomic level, the keys for the pollen flora are indispensable. There are several keys available for restricted areas, e.g., Taiwan (Huang, 1972), North America and a part of Europe (Moore and Webb, 1978; Moore et al., 1991), northwestern Europe (Faegri and Iversen, 1989), Barro Colorado Island, Panama (Roubik and Moreno P., 1991), however, those for pollen flora of Japan have not yet been published except for an original approach by Ikuse (1956), although the pollen morphology of Japanese plants has been well studied (Ikuse, 1956; Shimakura, 1973; Nakamura, 1980a, b). It is hard to identify pollen grains to species level even though using the keys. There may be two ways to resolve such difficulties by reducing the number of plant species taken into consideration: 1) to treat the flora of a small area, and 2) to treat only the plants flowering when the pollen grains are obtained. An example for 1) is the keys to species level for the pollen flora of Barro Colorado Island, Panama (Roubik and Moreno P., 1991), and for 2) is Ikuse (1956) showed the information on flowering seasons of treated plants.

The research forest of Kyoto University in Ashiu (35°20′ N, 135°45′ E) is located about 30 km north of Kyoto city. The half of this area, about 1800 ha, is covered

by well-reserved primary mixed forests dominated by Siebold's beech (*Fagus crenata* Blume) and Japanese Red Ceder (*Cryptomeria japonica* (L. f.) D. Don). To reveal the insect-flower relationship in the primary beech forest in Japan, the flowering phenology and the seasonal pettern of insect visits have been surveyed (Kato et al., 1990; Nagamitsu, unpublished).

Here, we provide the keys and descriptions available for identification of the pollen grains mainly used by bees, of the plants only in Ashiu with information on flowering season. Of 123 families 793 species of seed plants reported from Ashiu (Watanabe, 1970), 550 species of all the families are treated in the keys. The morphological characters of pollen grains of 248 species, which is highly possible to be used by bees, are described on the basis of the materials collected from Ashiu or near places. No photomicrographs of pollen grains are presented in this work, because good ones for the pollen flora of Japan are available in the literature (Ikuse, 1956; Shimakura, 1973; Nakamura 1980a, b; Kurosawa, 1991). The results of pollen analysis using these keys will be soon published.

Materials and Methods

The pollen grains of 248 species are obtained from the dried herbarium specimens collected from Ashiu or near places. The voucher specimens are preserved in the Herbarium (KYO), Faculty of Sciences, Kyoto University, and showed in parentheses in the description with the localities abbreviated as follows: A: Ashiu; F: Fukui Pref.; H: Hyogo Pref; I: Ishikawa Pref.; K: Kyoto Pref. except Ashiu; S: Shiga Pref. The pollen samples were acetolysed following the standard method (Erdtman, 1960), and mounted in Silicon oil for light microscopy.

The morphological information of adding 302 species was obtained from the literature. The quoted references are indicated by the number in the description as follows: 1: Ikuse, 1956; 2: Huang, 1972; 3: Shimakura, 1973; 4: Nakamura, 1980a, b.

Totally 550 species of all the families recorded from Ashiu are treated in the keys. The species listed in Watanabe (1970) but not included in the present work are listed in Appendix.

Morphological characters of pollen grains and flowering season in the study site are described. The flowering season is defined in monthly scale on the basis of field observations in 1991 and some references (Kato et al., 1990; Satake et al., 1981, 1982a, 1982b, 1989a, 1989b).

The descriptions of morphological characters of pollen grains are arranged as follows: 1) pollen type defined by arrangement of apertures (see the key to pollen types); 2) thickness (μm) of exine; 3) sculpture on sexine, and if conspicuous, the size of sculpting elements; 4) shape of aperture, and the size; 5) shape of pollen grain in equatorial and polar view; 6) range and average of diameter of grains in equatorial and polar axis ($n \geqq 20$), range and average of P/E ratio ($n \geqq 20$). The terminology used here follows those of Faegri and Iversen (1989) and Roubik and Moreno P.(1991). The definitions of the terms used for the six characters above are

listed in Glossary.

The keys are shown in a hierarchical arrangement. We provided a key to the 22 pollen types found in the study site at first, then showed a key to the families in each pollen type. The general descriptions of the families are arranged in alphabetical order irrespective of the systematic position. If the different kinds of pollen types are found in a family, general descriptions are divided to each kind of them. The key to the genera or species and morphological character of species are shown in at least observed materials and some additional species from the references.

Key to the pollen types

1a. Grains arranged in groups
  2a. Grains agglutinated, forming a mass, showing asymmetrical arrangement ..... Pollinia
  2b. Groups free, usually showing symmetrical arrangement
    3a. >8 grains per group ..... Polyads
    3b. 4 grains per group ..... Tetrads
1b. Grains single (Monads)
  4a. With air-sacks projecting from the body of grain ..... Vesiculate
  4b. With a coarse, high network of crest or ridges separated by depressed areas ..... Fenestrate
  4c. Without sacks and such ridges
    5a. Apertures absent ..... Inaperturate
    5b. Apertures present
      6a. Apertures occurring singly
        7a. Apertures pore type (shorter axis larger than half of the longer axis) ..... Monoporate
        7b. Apertures furrow type (shorter axis smaller than half of the longer axis) ..... Monocolpate
      6b. Apertures multiple
        8a. Exclusively pori
          9a. Pori 2 ..... Diporate
          9b. Pori 3 ..... Triporate
          9c. Pori more than 3
            10a. Pori arranged equatorially ..... Stephanoporate
            10b. Pori scatterd over the surface ..... Periporate
        8b. Exclusively colpi
          11a. Colpi 2 ..... Dicolpate
          11b. Colpi 3 ..... Tricolpate
          11c. Colpi more than 3
            12a. Colpi meridional, arranged equatorially ..... Stephanocolpate
            12b. Colpi scattered over the grain surface ..... Pericolpate
        8c. Both pori and colpi (colpori) present
          13a. Colpori 2 ..... Dicolporate
          13b. Colpori 3 ..... Tricolporate
          13c. Colpori more than 3
            14a. Colpori meridional, arranged equatorially ..... Stephanocolporate
            14b. Colpori scattered over the surface ..... Pericolporate
        8d. Both colpi and colpori present ..... Heterocolpate
        8e. Colpi or colpori fused, forming branched furrow, ring or spiral ..... Syncolpate

Key to the Families

Pollinia

1a. 2 similar pollinia united by 2 caudicles to a central corpusculum ..... Asclepiadaceae
1b. 1, 2, 4, 8 pollinia per pollinarium, if 2 pollinia present, 2 pollinia attached by 1 caudicle to glandula ..... Orchidaceae

Polyads

Polyads with 16 grains, circular, symmetrically arranged, 85-90 μm ..... Leguminosae (*Albizia*)

Tetrads

1a. Tetrads linear, flat or irregular, grains monoporate or diporate; sexine reticulate ..... Typhaceae
1b. Tetrads tetrahedal
2a. Grains inaperturate, exine 0.5 μm thick, occasionally broken in distal face, sexine scabrate ..... Juncaceae
2b. Grains tricolporate, exine 1.0-2.5 μm thick, sexine rugulate, verrucate, scabrate ..... Ericaceae and Pyrolaceae (*Chimaphila* and *Pyrola*)

Vesiculate

1a. 2 globular sacks attached to the grain ..... Pinaceae (*Abies* and *Pinus*)
1b. Continuous or interrupted ring-shaped rudimentary sack around the grain ..... Pinaceae (*Tsuga*)

Fenestrate

Sexine echinate; echinate ridges froming a network over the grain separating lacunae; grains 16-35 μm ..... Compositae (Lactucoideae)

Inaperturate

1a. Sexine echinate
2a. Grains $<20\mu$m ..... Araceae (*Arisaema*)
2b. Grains $>20\mu$m, usually damaged by acetolysis ..... Lauraceae
1b. Sexine striate; striae 1.0-2.0 μm wide, grains elliptic, 90-130 $\times$ 50-80 μm, damaged by acetolysis ..... Zingiberaceae
1c. Sexine psilate, scabrate, verrucate, gemmate
3a. Grains pear-shaped ..... Cyperaceae
3b. Grains not pear-shaped
4a. Exine 2.0-3.0 μm thick
5a. Verrucae 1.0 μm wide ..... Nymphaeaceae
5b. Verrucae 2.0-3.0 μm wide, formed by some bacula ..... Sciadopityaceae
4b. Exine 0.5-1.5 μm thick
6a. Grains $<17\mu$m ..... Liliaceae (*Smilax*) and Saururaceae
6b. Grains 17-30 μm
7a. Grains slightly ridged in proximal face ..... Cephalotaxaceae and Taxaceae
7b. Grains circular
8a. Sexine gemmate, scabrate ..... Cupressaceae
8b. Sexine verrucate, verrucae dense, occasionally forming broken reticulum, damaged by acetolysis ..... Salicaceae (*Populus*)
8c. Sexine verrucate, scabrate, verrucae scattered, never forming reticulum ..... Liliaceae (*Smilax*)
6c. Grains $>30\mu$m ..... Liliaceae (*Trillium*)

Monoporate

1a. Grains pear-shaped .....Cyperaceae
1b. Grains not so
2a. Pori >20 μm wide, more than half of the grain; sexine verrucate
3a. Pori with operculum, exine 2.0μm thick; verrucae 1.0μm wide
.....Nymphaeaceae
3b. Pori without operculum, exine 2.5-3.0μm thick; verrucae 2.0-3.0μm wide
.....Sciadopityaceae
2b. Pori <5.0μm wide
4a. Pori prominent, 3.0-6.0μm high .....Taxodiaceae
4b. Pori not prominent
4a. Anulus distinct ..... Gramineae
4b. Anulus absent
5a. Sexine scabrate, gemmate .....Cupressaceae
5b. Sexine reticulate, lumina 0.5-1.5μm wide .....Sparganiaceae

Diporate

1a. Grains compressed oval in equatorial view, elliptic in polar view, prolate; exine thickest at equator .....Acanthaceae (*Justicia*)
1b. Grains circular, spherical
2a. Pori circular 1.0μm wide, grains 7-16μm .....Urticaceae
2b. Pori circular 2.0-3.0μm wide, grains 11-29μm .....Moraceae

Triporate

1a. Vestibulum 5.0-12μm high .....Onagraceae
1b. Vestibulum absent
2a. Sexine echinate
3a. Exine 4.0-5.0μm thick, annuli thinned .....Verbenaceae (*Caryopteris*)
3b. Exine 1.0-2.0μm thick
4a. Annuli dropped inside, echini <1.0μm high
.....Campanulaceae
4b. Annuli never dropped inside, >2.0μm high echini present
.....Caprifoliaceae (*Weigela*) and Tiliaceae (*Corchoropsis*)
2b. Sexine scabrate, verrucate, rugulate
6a. Pori lolongate 3.5-6.0μm wide, grains oblate .....Pyrolaceae (*Monotropastrum*)
6b. Pori circular 2.0-3.0μm wide, grains spherical .....Moraceae
6c. Pori circular 1.5-2.0μm wide, grains oblate .....Betulaceae
6d. Pori circular 1.0μm wide, grains spherical .....Urticaceae

Stephanoporate

1a. Sexine echinate .....Campanulaceae
1b. Sexine rugulate
2a. Pori lolongate 2.0-3.5μm long .....Ulmaceae (*Ulmus* and *Zelkova*)
2b. Pori circular 1.5-2.0μm wide .....Betulaceae
1c. Sexine scabrate, verrucate
3a. Pori 5-8 .....Juglandaceae (*Pterocarya*)
3b. Pori 4
4a. Equatorial axis <20μm, annuli absent .....Liliaceae (*Chionographis*)
4b. Equatorial axis >20μm, annuli present .....Betulaceae

Periporate

1a. Grains irregular, usually pear-shaped, pori indistinct .....Cyperaceae
1b. Grains oblate
2a. Triangular or lobate in polar view, each lobe with 2 pori arranged meridionally

.....Leguminosae (*Dumasia*)
2b. Pentagonal or hexagonal in polar view, 2 pori in distal face and 5-7 pori on equator .....Juglandaceae (*Juglans*)
1c. Grains spherical.
3a. Sexine echinate .....Alismataceae (*Sagittaria*)
3b. Sexine reticulate, lumina 3.0-6.0 μm wide
.....Buxaceae and Polygonaceae (*Persicaria*)
3c. Sexine scabrate, verrucate, or baculate
4a. Annuli absent
5a. Grains >50 μm, exine 5.5 μm thick, pori dropped inside
.....Convolvulaceae (*Calystegia*)
5b. Grains <40 μm
6a. Exine 3.5-4.0 μm thick .....Thymelaeaceae
6b. Exine 1.5-2.0 μm thick
7a. Sexine verrucate; verrucae 1.0-4.0 μm wide, pori <10, 1.0-3.0 μm wide
.....Plantaginaceae (*Plantago*)
7b. Sexine scabrate, pori >10, 3.5-6.0 μm wide
8a. Grains polyhedral .....Alismataceae (*Alisma*)
8b. Grains globose .....Ranunculaceae (*Coptis* and *Thalictrum*)
4b. Annuli present
9a. Pori <5 .....Moraceae
9b. Pori 6-15
10a. Grains 15-22 μm, exine 1.5 μm thick .....Papaveraceae (*Macleaya*)
10b. Grains 21-59 μm, exine 2.5-3.0 μm thick .....Caryophyllaceae
9c. Pori 15-30
11a. Grains <20 μm .....Caryophyllaceae
11b. Grains >30 μm .....Apocynaceae
9d. Pori usually 30-50 .....Chenopodiaceae and Amaranthaceae

Monocolpate

1a. Sexine echinate, damaged by acetolysis .....Commelinaceae
1b. Sexine striate .....Dioscoreaceae
1c. Sexine rugulate
2a. Exine 1.0 μm thick, equatorial axis <35 μm
.....Magnoliaceae (*Magnolia salicifolia*)
2b. Exine 1.5-2.0 μm thick, equatorial axis >35 μm .....Pontederiaceae
1d. Sexine reticulate
3a. Equatorial axis <25 μm .....Dioscoreaceae and Liliaceae
3b. Equatorial axis 25-65 μm .....Liliaceae
3c. Equatorial axis >65 μm .....Amaryllidaceae, Iridaceae and Liliaceae
1e. Sexine scabrate, verrucate, gemmate
4a. Equatorial axis <18 μm .....Araceae (*Acorus*) and Saururaceae
4b. Equatorial axis 18-30 μm .....Liliaceae
4c. Equatorial axis 30-55 μm .....Commelinaceae, Liliaceae and Pontederiaceae
4d. Equatorial axis >55 μm
5a. Colpus narrow and prominent .....Magnoliaceae (*Magnolia obovata*)
5b. Colpus wide and flat .....Liliaceae

Tricolpate

1a. Sexine echinate
2a. Echini 1.5-2.0 μm high, scattered on shield-shaped verrucae .....Valerianaceae
2b. Echini not on shield-shaped verrucae
3a. Exine >3.0 μm thick, colpi with echinate operculum, or ragged, dropping inside
.....Dipsacaceae
3b. Exine <3.0 μm thick, without operculum

4a. Colpi <25 μm long, margo thickened .....Caprifoliaceae (*Abelia* and *Lonicera*)
4b. Colpi >25 μm long, ragged, margo thinned .....Verbenaceae (*Clerodendrum*)
1b. Sexine clavate, clavae connected on top forming reticulum .....Geraniaceae
1c. Sexine striate .....Aceraceae
1d. Sexine reticulate
5a. Lumina 4.0-6.0 μm wide, muri dupli-triplicolumellate
.....Polygonaceae (*Persicaria*)
5b. Lumina 0.5-2.5 μm wide, muri simplicolumellate
6a. Colpi short, less than half of the polar axis .....Saxifragaceae (*Deinanthe*)
6b. Colpi long, as long as the polar axis
7a. Polar axis <20 μm
8a. >1.0 μm wide lumina present
9a. Grains prolate .....Cruciferae and Salicaceae (*Salix*)
9b. Grains spherical .....Cruciferae, Labiatae and Trochodendraceae
8b. Lumina <1.0 μm wide
.....Hamamelidaceae, Lardizabalaceae and Menispermaceae
7b. Polar axis >20 μm
10a. Grains prolate
11a. Colpi rounded at ends, wide and sunken .....Cercidiphyllaceae
11b. Colpi acute at ends, narrow and flat
12a. Lumina <1.0 μm wide ..... Aceraceae, Berberidacexae (*Caulophyllum* and *Epimedium*) and Saxifragaceae (*Saxifraga*)
12b. >1.0 μm wide lumina present .....Berberidaceae (*Caulophyllum* and *Epimedium*), Cruciferae, Salicaceae (*Salix*) and Trochodendraceae
10b. Grains spherical-oblate
13a. Equatorial axis <20 μm
14a. >1.0 wide lumina present .....Labiatae and Trochodendraceae
14b. Lumina <1.0 μm wide .....Menispermaceae
13b. Equatorial axis 20-30 μm
15a. Colpi rounded at ends, wide and sunken .....Cercidiphyllaceae
15b. Colpi acute at ends, narrow and flat
16a. >1.0 μm wide lumina present .....Labiatae
16b. Lumina <1.0 μm wide .....Verbenaceae (*Callicarpa*) and Paeoniaceae
13c. Equatorial axis >30 μm .....Oxalidaceae and Rubiaceae (*Paederia*)
1e. Sexine verrucate, gemmate, rugulate
17a. Colpi 3.5 μm long, colpi acute at ends .....Haloragaceae
17b. Colpi >5.0 μm long
18a. Grains <30 μm .....Phrymaceae
18b. Grains >35 μm
19a. Verrucae 0.5-1.0 μm wide .....Solanaceae (*Scopolia*)
19b. Gemmae 1.5-2.0 μm wide .....Aristolochiaceae
1f. Sexine baculate
20a. Tectum reticulate
21a. Equatorial axis >25 μm .....Oxalidaceae
21b. Equatorial axis <25 μm .....Saxifragaceae (*Saxifraga*)
20b. Tectum psilate, scabrate
22a. Polar axis >32 μm .....Convolvulaceae (*Cuscuta*) and Ranunculaceae
22b. Polar axis <32 μm .....Phytolaccaceae and Scrophuraliaceae
1g. Sexine scabrate
23a. Polar axis >30 μm .....Labiatae (*Teucrium*)
23b. Polar axis <30 μm .....Orobanchaceae

Stephanocolpate

1a. Grains distinctly oblate

2a. Sexine echinate; polar axis 46-60 μm .....Caprifoliaceae (*Abelia* and *Lonicera*)
2b. Sexine reticulate; polar axis 10-17 μm .....Balsaminaceae
2c. Sexine verrucate, rugulate; polar axis 17-23 μm .....Haloragaceae
1b. Grains prolate-spherical
3a. Grains 4-5 colpate
4a. Sexine echinate .....Caprifoliaceae (*Abelia* and *Lonicera*)
4b. Sexine reticulate
5a. Grains 4 colpate, prolate .....Saxifragaceae (*Saxifraga*)
5b. Grains 5 colpate, spherical .....Chloranthaceae
4c. Sexine baculate, bacula forming tectum on top
6a. Polar axis $<30\mu$m .....Ranunculaceae and Saxifragaceae (*Saxifraga*)
6b. Polar axis $>30\mu$m .....Convolvulaceae (*Cuscuta*) and Ranunculaceae
4d. Sexine verrucate, rugulate
7a. Grains $<30\mu$m .....Haloragaceae
7b. Grains $>30\mu$m .....Solanaceae (*Scopolia*)
3b. Grains 6 colpate
8a. Colpi narrow, sunken, sharp .....Rubiaceae (*Galium* and *Rubia*)
8b. Colpi wide, flat, sharp or ragged
9a. Sexine reticulate .....Chloranthaceae and Labiatae
9b. Sexine baculate, bacula forming tectum on top, tectum scabrate, psilate .....Ranunculaceae
3c. Colpi 7-10
10a. Grains 14-26 μm, colpi sunken, sharp .....Rubiaceae (*Galium* and *Rubia*)
10b. Grains 27-35 μm, colpi flat, ragged .....Campanulaceae (*Codonopsis*)

Pericolpate

1a. Grains 4-5 colpate, colpi irregularly distributed .....Aristolochiaceae
1b. 6 colpate, colpi regularly distributed
2a. Sexine baculate, bacula forming tectum on top, colpi narrow, acute at ends .....Ranunculaceae
2b. Sexine verrucate, rugulate, colpi wide, rounded at ends .....Papaveraceae (*Corydalis*)
2c. Sexine reticulate, colpi wide, rounded at ends .....Eupteleaceae
1c. >10 colpate
3a. Sexine echinate, grains $>40\mu$m .....Portulacaceae
3b. Sexine reticulate, grains $<40\mu$m .....Polygonaceae (*Antenoron*)

Dicolporate

Exine thickest in equator, compressed oval in equatorial view, elliptic in polar view, prolate .....Acanthaceae (*Justicia*)

Tricolporate

1a. Sexine echinate .....Compositae (Asteroideae)
1b. Sexine clavate
2a. Prolate, equatorial axis 18-33 μm, pori lalongate, apocolpium 7.0-13 μm wide, clavae 1.5-2.0 μm high .....Aquifoliaceae
2b. Spherical, equatorial axis 32-44 μm, pori circular, apocolpium 18 μm wide, clavae 2.5-3.0 μm high .....Cornaceae (*Aucuba*)
1c. Sexine striate, rugulate, reticulate, baculate, verrucate, gemmate, scabrate, or psilate
3a. Grains distinctly oblate, P/E ratio <0.80
4a. Grains circular, semiangular in polar view
5a. Sexine reticulate .....Tiliaceae (*Tilia*)
5b. Sexine distinctly rugulate, vallae 1.5-3.0 μm wide .....Alangiaceae
4b. Grains angular, lobate in polar view. .....Symplocaceae
3b. Grains prolate-spherical, P/E ratio >0.80

6a. Grains angular in polar view with distinct vestibulum or thick margo
7a. Colpi short, with vestibulum .....Elaeagnaceae
7b. Colpi long, without vestibulum
8a. Sexine reticulate
9a. Pori circular 1.8μm wide .....Vitaceae (*Vitis*)
9b. Pori lalongate
10a. Grains compressed rhomboidal in equatorial view; exine 1.0-1.5μmthick .....Rhamnaceae
10b. Grains depressed rhomdoidal in equatorial view; exine 1.7-2.7μm thick .....Araliaceae
8b. Sexine baculate, bacula forming tectum on top, tectum scabrate .....Umbelliferae
8c. Sexine verrucate, rugulate, scabrate
11a. Polar axis >30μm
12a. Grains prolate .....Cornaceae (*Swida*)
12b. Grains spherical .....Styracaceae
11b. Polar axis <30μm
13a. Equatorial axis >25μm .....Styracaceae
13b. Equatorial axis <25μm
14a. Grains compressed rhomboidal in equatorial view .....Rhamnaceae
14b. Grains oval or equatorial acute oval in equatorial view .....Cornaceae (*Benthamidia*)
6b. Grains circular, semiangular in polar view
15a. Grains compressed, constricted oval in equatorial view and prolate
16a. Pori circular, lolongate
17a. Colpi echinate .....Hippocastanaceae
17b. Colpi not echinate .....Leguminosae
16b. Pori lalongate
18a. Sexine reticulate, striate .....Anacardiaceae
18b. Sexine baculate, bacula forming tectum on top, tectum scabrate .....Umbelliferae
18c. Sexine psilate, pori H-shaped .....Primulaceae (*Lysimachia*)
15b. Grains not compressed, constricted oval in equatorial view
19a. Sexine striate
20a. Colpi equatorial prominent
21a. Pori lolongate .....Santalaceae (*Buckleya*)
21b. Pori lalongate .....Rosaceae
20b. Colpi not equatorial prominent
22a. Pori lalongate and apiculate at both lateral ends .....Gentianaceae
22b. Pori not so
23a. Margo thickened .....Cucurbitaceae (*Gynostemma*)
23b. Margo not thickened .....Aceraceae
19b. Sexine rugulate
24a. Equatorial axis >50μm, vallae 1.5-3.0μm wide .....Alangiaceae
24b. Equatorial axis <50μm, vallae <1.5μm wide
25a. Pori lolongate and elliptic .....Leguminosae
25b. Pori lalongate, circular and sometimes ragged or torn
26a. Equatorial axis >20μm .....Rosaceae and Styracaceae
26b. Equatorial axis <20μm .....Guttiferae and Rosaceae
19c. Sexine reticulate
27a. Pori lolongate .....Leguminosae and Theaceae
27b. Pori circular
28a. Colpi prominent at equator
29a. Margo thinned
30a. Grains prolate .....Guttiferae
30b. Grains spherical .....Celastraceae (*Celastrus*)

29b. Margo thickened .....Leguminosae and Theaceae
28b. Colpi not prominent at equator
31a. Exine >2.0 μm thick
32a. >1.0 μm wide lumina present, margo thinned .....Celastraceae
32b. Lumina indistinct .....Aceraceae
31b. Exine <2.0 μm thick .....Saxifragaceae
27c. Pori lalongate
33a. Equatorial axis >40 μm .....Cucurbitaceae (*Melothria*)
33b. Equatorial axis <40 μm
34a. Pori slit-like, <0.5 μm wide .....Vitaceae (*Ampelopsis*)
34b. Pori apiculate at both lateral ends
35a. Lumina indistinct, <1.0 μm wide .....Gentianaceae
35b. >1.0 μm wide lumina present .....Vitaceae (*Parthenocissus*)
34c. Pori oval, or constricted, compressed oval
36a. >1.0 μm wide lumina present
37a. Muri distincltly visible .....Oleaceae
37b. Muri indistinct
38a. Equatorial axis >25 μm
39a. Grains semiangular in polar view ....Araliaceae and Rutaceae
39b. Grains circular in polar view
.....Rubiaceae (*Mitchella*) and Rutaceae
38b. Equatorial axis <25 μm
40a. Polar axis >20 μm
41a. Margo thinned .....Caprifoliaceae (*Viburnum*) and Rutaceae
41b. Margo thickened
42a. Grains semiangular in polar view
.....Araliaceae and Rutaceae
42b. Grains circular in polar view.....Rutaceae and Sabiaceae
40b. Polar axis <20 μm
43a. Colpi straight at equator .....Flacourtiaceae (*Idesia*)
43b. Colpi convex at equator
44a. Margo thinned .....Caprifoliaceae (*Viburnum*)
44b. Margo thickened .....Sabiaceae
36b. Lumina <0.5-1.0 μm wide
45a. Polar axis <15 μm .....Guttiferae, Myrsinaceae and Saxifragaceae
45b. Polar axis 15-20 μm
46a. Margo thinned
.....Caprifoliaceae (*Sambucus*) and Scrophuraliaceae
46b. Margo not thinned .....Diapensiaceae and Saxifragaceae
45c. Polar axis >20 μm
47a. Margo thickened .....Anacardiaceae
47b. Margo thinned .....Scrophuraliaceae and Euphorbiaceae
47c. Margo neither thickened nor thinned
.....Aceraceae, Diapensiaceae, Paeoniaceae and Saxifragaceae
19d. Sexine baculate
48a. Bacula scattered, 2.0-4.0 μm high, colpi wide, rounded at ends
.....Loranthaceae
48b. Bacula forming tectum on top, colpi acute at ends, narrow
49a. Pori zonorate .....Polygonaceae (*Reynoutria*)
49b. Pori lalongate
50a. Margo thickened .....Polygonaceae (*Bistorta* and *Polygonum*)
50b. Margo thinned .....Euphorbiaceae and Phrymaceae
50c. Margo neither thickened nor thinned .....Polygonaceae (*Rumex*)
19e. Sexine verrucate, gemmate
51a. Pori zonorate .....Euphorbiaceae (*Mallotus*)
51b. Pori lolongate .....Daphniphyllaceae

51c. Pori circular, indistinct
52a. Polar axis <19 μm
53a. Pori 5.0 μm wide .....Leguminosae (*Lotus*)
53b. Pori 3.0 μm wide .....Compositae (*Artemisia*)
52b. Polar axis >19 μm
54a. Prolate .....Leguminosae
54b. Spherical .....Fagaceae (*Quercus* and *Fagus*)
51d. Pori lalongate
55a. Pori >5.0 μm long
56a. Exine >1.5 μm thick .....Rosaceae and Styracaceae
56b. Exine <1.5 μm thick .....Icacinaceae and Rosaceae
55b. Pori <5.0 μm long .....Cornaceae (*Benthamidia*) and Rosaceae
19f. Sexine scabrate, psilate
57a. Colpi short, less than half of the grains
58a. Polar axis <20 μm .....Euphorbiaceae (*Acalypha*)
58b. Polar axis >30 μm .....Leguminosae (*Apios*)
57b. Colpi long, more than half of the grains
59a. Pori zonorate .....Euphorbiaceae (*Mallotus*)
59b. Pori lolongate
60a. Polar axis <10 μm .....Gesneriaceae
60b. Polar axis >10 μm .....Leguminosae
59c. Pori circular
61a. Polar axis >20 μm .....Lythraceae (*Rotala*) and Violaceae
61b. Polar axis <20 μm .....Crassulaceae and Violaceae
59d. Pori lalongate, indistinct, ragged or torn
62a. Colpi prominent or constricted at equator
63a. Pori meridionally constricted, grains hexagonal in polar view
.....Stachyuraceae
63b. Pori not so, grains semiangular or circular in polar view
64a. Polar axis <15 μm
.....Theaceae (*Eurya*), Solanaceae and Rosaceae
64b. Polar axis 15-20 μm
65a. Sexine scabrate
.....Actinidiaceae, Rosaceae, Solanaceae and Violaceae
65b. Sexine psilate .....Clethraceae and Violaceae
64c. Polar axis >20 μm
66a. Equatorial axis <20 μm
67a. Semiangular in polar view .....Rosaceae and Solanaceae
67b. Circular in polar view
..... Actinidiaceae, Cornaceae (*Helwingia*), Rosaceae and Violaceae
66b. Equatorial axis >20 μm
68a. Semiangular in polar view
..... Cornaceae (*Benthamidia*), Rosaceae, Solanaceae and Styracaceae
68b. Circular in polar view
..... Cornaceae (*Helwingia*), Rosaceae, Violaceae and Icacinaceae
62b. Colpi nethier prominent nor constricted at equator
69a. Polar axis <15 μm .....Fagaceae (*Castanea*)
69b. Polar axis 15-30 μm
70a. Colpi rounded at ends .....Campanulaceae (*Lobelia*)
70b. Colpi acute at ends ..... Cornaceae (*Helwingia*), Ericaceae (*Enkianthus*) and Violaceae
69c. Polar axis >30 μm .....Ebenaceae and Violaceae

Stephanocolporate

1a. Colpi rounded at ends, irregular, pori not in the center of colpus, sometimes 2 pori share the same colpus, pori circular 2.0-3.5 μm wide .....Saxifragaceae (*Ribes*)
1b. Colpi acute at ends, always 1 pore in the center of colpus
2a. >10 colporate
3a. Prolate .....Polygalaceae
3b. Spherical-oblate .....Lentibulariaceae
2b. 4-8 colporate
4a. Sexine rugulate, grains 52-90 μm .....Alangiaceae
4b. Sexine striate
5a. Pori lalongate .....Rutaceae (*Skimmia*)
5b. Pori circular .....Euphorbiaceae (*Phyllanthus*)
4c. Sexine reticulate
6a. Colpi wide, margo thinned .....Celastraceae
6b. Colpi narrow, margo not thinned
7a. Colpi shorter, 10 μm long, pori lalongate .....Rubiaceae (*Hedyotis*)
7b. Colpi longer, pori circular .....Euphorbiaceae (*Phyllanthus*)
4c. Sexine scabrate, colpi short, equatorial prominent.....Euphorbiaceae (*Acalypha*)

Pericolporate

Exine 1.5-2.0 μm thick, colpi acute at ends, costae, grains 15-32 μm
.....Polygonaceae (*Rumex*)

Syncolpate

1a. Grains heteropolar, pyramid in equatorial view, triangular in polar view, 3 colpori joining at proximal pole .....Santalaceae (*Thesium*)
1b. Grains isopolar, oval in equatorial view, circular in polar view
2a. Pori present, pori circular 3.0 μm wide, dropped, costae .....Lythraceae (*Rotala*)
2b. Pori absent
3a. 6 colpi meridional, 3 colpi of 6 joining at polar .....Schisandraceae
3b. Colpi forming parallel spirals around the grain
4a. 3-4 spirals, sexine echinate, grains 20-26 μm .....Eriocaulaceae
4b. 6-8 spirals, sexine psilate, grains 14-21 μm .....Araceae (*Pinellia*)
3c. 1-3 colpi forming a ring around the grain
5a. Sexine verrucate, a ring around the distal polar seems large pore with operculum .....Nymphaeaceae
5b. Sexine psilate, 2 colpi jointing at the poles forming a ring, sometimes broken along the colpi.....Scrophuraliaceae (*Pedicularis*)
5c. Sexine reticulate, 2-3 colpi jointing at the poles .....Berberidaceae (*Berberis*)

Heterocolpate

1a. Polar axis 8-12 μm, sexine psilate; grains constricted, compressed oval in equatorial view, prolate .....Boraginaceae
1b. Polar axis 18-31 μm, sexine striate, oval in equatorial view, spherical
.....Lythraceae (*Lythrum*)
1c. Polar axis 57-63 μm, sexine reticulate, oval in equatorial view, prolate
.....Acanthaceae (*Peristrophe*)

Key to the genera and species, and descriptions

Acanthaceae (2 genera, 2 species)

Justicia (1 species)

Justicia procumbens L. var. *leucantha* Honda 'Kitsunenomago'

Diporate (dicolporate) monad; exine 3.0-5.0 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide; colpi 12 μm wide, 2 rows of verrucae arranged meridionally; pori lalongate 3.0 × 6.0 μm wide; compressed oval in equatorial view, elliptic in polar view; polar axis 23-25-28 μm, longer equatorial axis 15-17-20 μm, P/E ratio 1.33-1.46-1.61; flowering in Aug-Oct. (*G. Murata 12161*; Loc. H)

Peristrophe (1 species)

Peristrophe japonica (Thunb.) Bremek. 'Hagurosou'

Heterocolpate (with 3 colpori and 6 furrows) monad; exine 7.5 μm thick; sexine reticulate, lumina 3.0-6.0 μm wide; oval in equatorial view, circular in polar view; polar axis 57-63 μm, equatorial axis 45-56 μm, prolate; flowering in Sep-Oct. (ref. 4)

Aceraceae (1 genus, 11 species)

Tricolpate, tricolporate monad; exine 1.2-2.7 μm thick; sexine striate, scabrate, reticulate; colpi acute at ends, or rectangular, apocolpium 2.5-7.0 μm wide; if pori present, pori lolongate, circular, lalongate 3.0-7.0 μm long; oval in equatorial view, circular in polar view; polar axis 17-35 μm, equatorial axis 16-29 μm, spherical-prolate; flowering in Apr-Aug.

ref. *Acer cissifolium* (Sieb. et Zucc.) K. Koch, 'Mitsudekaede' (Apr-May): 1.

1a. Tricolpate
  2a. Sexine striate, apocolpium 3.0-5.0 μm wide
    3a. Sxine >1.6 μm thick ..... *Acer crataegifolium, A. rufinerve*
    3b. Exine <1.6 μm thick ..... *Acer mono*
  2b. Sexine scabrate, apocolpium 5.0-7.0 μm wide ..... *Acer carpinifolium*
1b. Ticolporate, sexine striate
  4a. Pori circular, lalongate
    5a. Pori distinct >4 μm wide
      6a. Exine >2.4 μm thick ..... *Acer palmatum, A. sieboldianum*
      6b. Exine <2.4 μm thick
        7a. Costae >2.0 μm thick, prolate ..... *Acer japonicum*
        7b. Costae <2.0 μm thick, spherical ..... *Acer amoenum*
    5b. Pori indistinct <4 μm wide ..... *Acer crataegifolium*
  4b. Pori lolongate
    8a. Polar axis >28 μm, pori distinct, costae >2.0 μm thick ..... *Acer japonicum*
    8b. Polar axis <28 μm, pori indistinct, costae <2.0 μm thick
      ..... *Acer rufinerve, A. nipponicum*

Acer amoenum Carr. var. *amoenum* 'Oomomiji'

Tricolporate monad; exine 1.9 μm thick; sexine striate; colpi acute at ends, apocolpium 2.5-4.0 μm wide; pori circular, lalongate 4.0 × 5.0 μm, costae 1.5 μm

thick; polar axis 23-25-28 μm, equatorial axis 20-24-28 μm, P/E ratio 0.95-1.08-1.19; flowering in Apr-May. (*S. Okamoto s.n.*; Loc. A)

A. amoenum Carr. var. *matsumurae* (Koidz.) Ogata 'Yamamomiji'
Tricolporate monad; exine 2.2 μm thick; sexine striate; colpi acute at ends, apocolpium 3.0-4.0 μm wide, pori lalongate 4.0 × 5.0-7.0 μm , costae 1.5 μm thick; polar axis 23-26-29 μm, equatorial axis 17-24-27 μm, P/E ratio 0.95-1.10-1.36; flowering in Apr-May. (*G. Murata and N. Fukuoka 319*; Loc. S)

A. carpinifolium Sieb. et Zucc. 'Chidorinoki'
Tricolpate monad; exine 1.6 μm thick; sexine scabrate; colpi acute at ends, apocolpium 5.0-7.0 μm wide; polar axis 22-25-28 μm, equatorial axis 22-24-27 μm, P/E ratio 0.94-1.02-1.12; flowering in May. (*S. Okamoto 15105*; Loc. A)

A. crataegifolium Sieb. et Zucc. 'Urikaede'
Tricolporate, tricolpate monad; exine 2.0 μm thick; sexine striate; colpi acute at ends, apocolpium 3.0-4.0 μm wide; pori lalongate 1.5 × 3.0-4.0 μm, indistinct; polar axis 21-24-27 μm, equatorial axis 16-20-23 μm, P/E ratio 1.00-1.19-1.43; flowering in Apr-May. (*Anonymous s.n.*, Loc. K)

A. japonicum Thunb. 'Hauchiwakaede'
Tricolporate monad; exine 1.8 μm thick; sexine striate; colpi acute at ends or rectangle, apocolpium 3.0-4.0 μm wide; pori circular, lolongate 5.0-6.0 μm wide, costae 2.5 μm thick; polar axis 27-31-35 μm, equatorial axis 20-24-29 μm, P/E ratio 1.14-1.27-1.39; flowering in May-Jun. (*H. Nagamasu 4480*; Loc. A)

A. mono Maxim. 'Itayakaede'
Tricolpate monad; exine 1.2 μm; sexine striate; colpi acute at ends, apocolpium 3.0-4.0 μm wide; polar axis 21-25-28 μm, equatorial axis 22-24-27 μm, P/E ratio 0.85-1.02-1.17; flowering in Apr-May. (*S. Okamoto s.n.*; Loc. A)

A. nipponicum Hara 'Tetsukaede'
Tricolporate monad; exine 2.0 μm thick; sexine striate; colpi acute at ends, apocolpium 5.0-6.0 μm wide; pori lolongate 5.0-7.0 × 2.0-4.0 μm, costae 1.0-1.5 μm thick; polar axis 20-23-28 μm, equatorial axis 17-21-25 μm, P/E ratio 0.94-1.15-1.43; flowering in Jul-Aug. (*G. Nakai 3342*; Loc. A)

A. palmatum Thunb. 'Irohamomiji'
Tricolporate monad; exine 2.7 μm thick; sexine striate; colpi acute at ends, apocolpium 4.0-5.0 μm wide; pori circular 6.0 μm wide, costae 1.0-1.5 μm thick; polar axis 25-27-30 μm, equatorial axis 21-25-28 μm, P/E ratio 1.04-1.10-1.18; flowering in Apr-May. (*H. Naruhashi and I. Kojima 1432*; Loc. S)

A. rufinerve Sieb. et Zucc. 'Urihadakaede'
Tricolporate monad; exine 2.0 μm thick; sexine striate; colpi acute at ends, apocolpium 3.0-5.0 μm wide; pori lolongate 4.0 × 2.0-3.0 μm, indistinct; polar axis 20-23-25 μm, equatorial axis 20-21-24 μm, P/E ratio 1.00-1.09-1.25; flowering in May.

(*T. Morita s.n.*; Loc. F)

A. sieboldianum Miq. 'Kohauchiwakaede'
Tricolporate monad; exine 2.6 μm thick; sexine striate, reticulate; colpi acute at ends, apocolpium 4.0-5.0 μm wide; pori circular, lalongate 4.0-5.0 × 6.0 μm, costae 1.5 μm thick; polar axis 22-24-27 μm, equatorial axis 18-21-24 μm, P/E ratio 1.05-1.15-1.27; flowering in May-Jun. (*M. Umebayashi 1667*; Loc. A)

Actinidiaceae (1 genus, 2 species)

Tricolporate monad; exine 1.5 μm thick; sexine scabrate; colpi acute at ends, equatorial prominent, apocolpium 3.0-5.0 μm wide; pori lalongate 0.5-2.0 × 3.0-6.0 μm, sometimes ragged H-shape, costae 1.0-1.5 μm thick; oval in equatorial view, circular in polar view; polar axis 16-23 μm, equatorial axis 15-19 μm, prolate-spherical; flowering in May-Jul.

Actinidia arguta (Sieb. et Zucc.) Planch. ex Miq. 'Sarunashi'
Apocolpium 3.0-4.0 μm wide; pori 4.0-6.0 × 0.5-2.0 μm; polar axis 16-18-20 μm, equatorial axis 15-16-19 μm, P/E ratio 0.92-1.11-1.34; flowering in May-Jul. (*G. Murata 1534*; Loc. K)

A. polygama (Sieb. et Zucc.) Planch. ex Maxim. 'Matatabi'
Apocolpium 4.0-5.0 μm wide; pori 3.0-5.0 × 0.5-2.0 μm; polar axis 16-19-23 μm, equatorial axis 16-18-19 μm, P/E ratio 1.00-1.05-1.20 (n=11); flowering in Jun-Jul. (*S. Kitamura s.n.*; Loc. K)

Alangiaceae (1 genus, 1 species)

Alangium platanifolium (Sieb. et Zucc.) Harms 'Urinoki'
Tricolporate, stephanocolporate (4-5 colporate) monad; exine 5.0-7.0 μm thick; sexine rugulate, vallae 1.5-3.0 μm wide; colpi 40 μm long, 7-15 μm wide; pori lalongate 12 × 16 μm ; oval in equatorial view, circular in polar view; polar axis 52-63-78 μm; equatorial axis 65-77-90 μm, P/E ratio 0.64-0.82-1.00; flowering in Jun. (*M. Ito et al. 1264*; Loc. A)

Alismataceae (2 genera, 2 species)

Alisma (1 species)

Alisma canaliculatum A. Br. et Bouche 'Heraomodaka'
Periporate (15-20 porate) monad; exine 2.0 μm thick; sexine scabrate; pori 5.0 μm wide, with verrucae, irregular shape, surrounded by hexagonal ridges; grains polyhederal; grains 26-30-34 μm; flowering in Aug-Oct. (*G. Murata 46628*; Loc. H)

Sagittaria (1 species)
Sagittaria trifolia L. 'Omodaka'

Periporate (ca. 10 porate) monad; exine 1.0 μm thick; sexine echinate, echini 1.0 μm high; pori 3.0-6.0 μm wide; grains circular; grains 17-22 μm; flowering in Jul-Oct. (ref. 4)

Amaranthaceae (1 genus, 2 species)

Periporate (30-50 porate) monad; exine 1.0-2.0 μm thick; sexine scabrate; pori 2.0 μm wide, annuli present; grains circular; grains 16-29 μm; flowering in Jul-Sep.
ref. *Amaranthus bidentata* Blume, 'Inokozuchi' (Aug-Sep): 4; *Amaranthus lividus* L., 'Inubiyu' (Jul-Sep): 4.

Amaryllidaceae (1 genus, 1 species)

Lycoris radiata Herb. 'Higanbana'
Monocolpate monad; exine 3.0-4.0 μm thick; sexine reticulate, lumina 1.0-2.5 μm wide, muri duplicolumellate, heterobrochate; grains elliptic; polar axis 25-38-50 μm, longer equatorial axis 65-73-80 μm; flowering in Sep. (*S. Tsugaru 15417*; Loc. K)

Anacardiaceae (1 genus, 5 species)

Tricolporate monad; exine 1.5-1.8 μm thick; sexine reticulate, striate, lumina 0.5-1.0 μm wide; colpi rounded at ends, margo thickened, apocolpium 2.5-5.0 μm wide; pori lalongate 1.5-2.0 × 7.0-13 μm , costae 1.5-2.0 μm thick; oval, compressed rhomboidal in equatorial view, circular, semiangular, hexagonal in polar view; polar axis 19-32 μm, equatorial axis 17-27 μm, prolate; flowering in May-Sep.
ref. *Rhus sylvestris* Sieb et Zucc., 'Yamahaze' (May-Jun): 4; *R. verniciflua* Stokes, 'Urushi' (May-Jun): 1.

1a. Sexine striate, pori >12 μm long ..... *Rhus javanica*
1b. Sexine reticulate, lumina 0.5-1.0 μm wide, pori <12 μm long
2a. Pori >9.0 μm long, apocolpium <4.0 μm wide ..... *R. trichocarpa*
2b. Pori <9.0 μm long, apocolpium >4.0 μm wide ..... *R. ambigua*

Rhus ambigua Lavall. ex Dipp. 'Tsutaurushi'
Exine 1.8 μm thick; sexine reticulate, striate; apocolpium 4.0-5.0 μm wide; pori lalongate 7.0-1.5-2.0 × 8.0 μm , costae 1.5-2.0 μm thick; semiangular in polar view; polar axis 25-27-30 μm, equatorial axis 16-19-22 μm, P/E ratio 1.23-1.42-1.85; flowering in Jun-Jul. (*G. Nakai 2279*; Loc. K)

R. javanica L. 'Nurude'
Exine 1.5 μm thick; sexine striate; apocolpium 4.0-5.0 μm wide; pori lalongate 2.0 × 13 μm , ragged, costae 1.5 μm thick; hexagonal in polar view; polar axis 27-29-32 μm, equatorial axis 21-24-27 μm, P/E ratio 1.10-1.23-1.36; flowering in Aug-Sep. (*S. Hosomi 7490*; Loc. H)

R. trichocarpa Miq. 'Yamaurushi'

Exine 1.5 μm thick; sexine reticulate, striate, lumina 0.5-1.0 μm wide; apocolpium 2.5-4.0 μm wide; pori lalongate 2.0 × 9.0-10 μm, costae 1.5-2.0 μm thick; circular, hexagonal in polar view; polar axis 20-24-28 μm, equatorial axis 17-20-22 μm, P/E ratio 1.00-1.22-1.38; flowering in Jun-Jul. (*G. Murata and T. Shimizu 1664*; Loc. H)

Apocynaceae (1 genus, 1 species)

Trachelospernum asiaticum (Sieb. et Zucc.) Nakai 'Teikakazura'
Periporate (15-20 porate) monad; exine 1.0 μm thick; sexine scabrate; pori circular 2.0-3.5 μm wide, annuli and costae 0.5 μm thick; grains circular; grains 35-41-45 μm; flowering in May-Jun. (*S. and T. Fujii 2036*; Loc. K)

Aquifoliaceae (1 genus, 6 species)

Tricolporate monad; exine 3.0-4.0 μm thick; sexine clavate, clavae 1.5-2.0 μm high, 1.0-2.0 μm wide; colpi rounded at ends, constricted at equator, apocolpium 7.0-13 μm wide, margo thinned; pori lalongate 1.0-3.0 × 5.0-8.0 μm, indistinct, costae 1.5-2.0 μm thick; oval in equatorial view, circular in polar view; polar axis 20-38 μm, equatorial axis 18-33 μm, prolate; flowering in Jun-Jul.
ref. *Ilex geniculata* Maxim., 'Fuurin'umemodoki' (Jun-Jul): 3; *I. sugerokii* Maxim., 'Kurosoyogo' (Jul): 1.

1a. Polar axis >31 μm
  2a. Exine >3.5 μm thick ..... *Ilex macropoda, I. pedunculosa*
  2b. Exine <3.5 μm thick ..... *I. leucoclada*
1b. Polar axis <31 μm ..... *I. macropoda, I. crenata*

Ilex crenata Thunb. 'Inutsuge'
Exine 3.5 μm thick; clavae 1.5 μm high, 1.0 μm wide; apocolpium 8.0-9.0 μm wide; pori lalongate 2.0 × 8.0 μm, costae 1.5-2.0 μm thick; polar axis 23-26-29 μm, equatorial axis 22-24-27 μm, P/E ratio 1.00-1.09-1.17 (n=9); flowering in Jun-Jul. (*K. Nagai 25010*; Loc. K)

I. leucoclada (Maxim.) Makino 'Himemochi'
Exine 3.0 μm thick; clavae 1.5-2.0 μm high, 1.0-2.0 μm wide; apocolpium 7.0-10 μm wide; pori lalongate 2.5 × 7.5 μm , costae 1.5 μm thick; polar axis 32-34-37 μm, equatorial axis 23-26-29 μm, P/E ratio 1.17-1.33-1.47 (n=12); flowering in Jun-Jul. (*S. Tsugaru 6925*; Loc. I)

I. macropoda Miq. 'Aohada'
Exine 4.0 μm thick; clavae 2.0 μm high, 1.0-2.0 μm wide; colpi rounded at ends, apocolpium 9.0-10 μm wide; pori lalongate 1.0-3.0 × 5.0-7.0 μm, costae 2.0 μm thick; polar axis 27-30-33 μm, equatorial axis 23-27-30 μm, P/E ratio 1.00-1.12-1.26; flowering in Jun. (*M. Ito et al. 1286*; Loc. A)

I. pendunclosa Miq. 'Soyogo'

Exine 4.0 μm thick; clavae 2.0 μm high, 1.0-2.0 μm wide; apocolpium 9.0-13 μm wide; pori lalongate 1.5 × 6.0 μm, indistinct, costae 1.5-2.0 μm thick; polar axis 31-33-38 μm, equatorial axis 25-28-33 μm, P/E ratio 1.03-1.18-1.43; flowering in Jun-Jul. (*N. Kurosaki 15787*; Loc. H)

Araceae (3 genera, 5 species)

Acorus (1 species)

Acorus calamus L. 'Shoubu'
Monocolpate monad; exine 1.0 μm thick; sexine scabrate; grains elliptic; polar axis 10-18 μm, equatorial axis 10-17 μm; flowering in May-Jul. (ref. 4)

Arisaema (3 species)
Inaperturate monad; exine 1.0-1.5 μm thick; sexine echinate, echini <0.5 μm high; grains circular; grains 10-20 μm; flowering in Apr-Jun.
ref. *Arisaema serratum* (Thunb.) Schott, 'Kouraitennanshou' (Apr-Jun): 3; *A. yamatense* (Nakai) Nakai, 'Muroutennanshou' (Apr-Jun): 1.

Arisaema amurense Maxim. ssp. *robustum* (Engler) Ohashi et J. Murata
var. *ovale* (Nakai) Ohashi et J. Murata 'Ashiutennanshou'
Grains 15-17-20 μm; flowering in Apr-Jun. (*H. Nagamasu 4494*; Loc. A)

Pinellia (1 species)

Pinellia ternata (Thunb.) Breit. 'Karasubishaku'
Syncolpate monad; exine 1.0-1.5 μm thick; sexine psilate; colpi parallel 6-8 spirals around the grain; grains circular; grains 14-21 μm; flowering in May-Aug. (ref. 4)

Araliaceae (5 genera, 8 species)

Tricolporate monad; exine 1.7-2.7 μm thick, thicker in mesocolpia; sexine reticulate, lumina 0.5-1.5 μm wide; colpi acute at ends, apocolpium 5.0-12 μm wide, margo thickened; pori lalongate 2.0-6.0 × 6.0-11 μm, costae 1.0-2.0 μm thick; depressed rhomboidal, oval in equatorial view, angular, semiangular in polar view; polar axis 21-36 μm, equatorial axis 17-36 μm, prolate-spherical; flowering in May-Sep.
ref. *Acanthopanax divaricatus* Seem., 'Keyamaukogi' (Aug-Sep): 4; A. *spinosus* (L. fil.) Miq., 'Yamaukogi', (May-Jun): 4; *Panax japonicus* C. A. Mayer, 'Tochibaninjin' (Jun-Aug): 4.

1a. Apocolpium <8.0 μm wide ..... *Evodiopanax innovans*
1b. Apocolpium >8.0 μm wide
2a. Grains prolate, P/E ratio >1.15
3a. Polar axis >30 μm ..... *Acanthopanax divaricatus*
3b. Polar axis <30 μm ..... *Acanthopanax sciadophylloides, Kalopanax pictus*
2b. Grains spherical, P/E ratio <1.15
4a. Oval in equatorial view, lumina <1.0 μm wide
..... *Aralia cordata, Panax japonicus*
4b. Depressed rhomboidal in equatorial view, >1.0 μm wide lumina present

5a. Pori >7.0 μm long ..... *Kalopanax pictus*
5b. Pori <7.0 μm long ..... *Aralia elata*

Acanthopanax sciadophylloides Fr. et Sav. 'Koshiabura'
Exine 2.0 μm thick; lumina 0.5-1.0 μm wide, muri 0.5 μm wide; apocolpium 9.0-10 μm wide; pori lalongate 2.0-4.0 × 8.0-10 μm, costae 1.0-2.0 μm thick; equatorial acute oval in equatorial view, angular in polar view; polar axis 23-27-30 μm, equatorial axis 17-22-27 μm, P/E ratio 1.10-1.24-1.47; flowering in Aug-Sep. (*S. Okamoto s.n.*; Loc. A)

Aralia cordata Thunb. 'Udo'
Exine 1.7 μm thick; lumina 0.5 μm wide, muri 0.5 μm wide; apocolpium 8.0-12 μm wide; pori lalongate 3.0-5.0 × 6.0-9.0 μm , costae 1.0-1.5 μm thick; oval in equatorial view, semiangular in polar view; polar axis 25-28-30 μm, equatorial axis 22-26-29 μm, P/E ratio 0.95-1.08-1.34; flowering in Aug-Sep. (*Y. Araki 13523*; Loc K)

A. elata (Miq.) Seemann 'Taranoki'
Exine 2.0 μm thick; lumina 0.5-1.5 μm wide, muri <0.5 μm wide; apocolpium 10-12 μm wide; pori lalongate 3.0-4.0 × 6.0-7.0 μm, costae 1.0-1.5 μm thick; equatorial acute oval in equatorial view, angular in polar view; polar axis 21-25-28 μm, equatorial axis 20-24-27 μm, P/E ratio 0.95-1.04-1.17; flowering in Aug. (*G. Nakai 5674*; Loc. K)

Evodiopanax innovans (Sieb. et Zucc.) Nakai 'Takanotsume'
Exine 1.7 μm thick; lumina 0.5-1.0 μm wide, muri <0.5 μm wide; apocolpium 5.0-8.0 μm wide, margo 2.0-2.5 μm thick; pori lalongate 4.0-6.0 × 8.0-11 μm; equatorial acute oval in equatorial view, semiangular in polar view; polar axis 28-31-34 μm, equatorial axis 26-29-32 μm, P/E ratio 1.00-1.07-1.23; flowering in May-Jun. (*S. Tanaka s.n.*; Loc. K)

Kalopanax pictus (Thunb.) Nakai 'Harigiri'
Exine 1.8 μm thick; lumina 0.5-1.0 μm wide, muri simplicolumellate, <0.5 μm wide; apocolpium 8.0-11 μm wide, margo 2.0 μm thick; pori lalongate 4.0 × 7.0-10 μm, costae 1.0-1.5 μm thick; equatorial acute oval in equatorial view, semiangular in polar view; polar axis 25-28-30 μm, equatorial axis 22-25-27 μm, P/E ratio 1.00-1.12-1.23; flowering in Jul-Aug. (*T. Sakuya 109*; Loc. K)

Aristolochiaceae (1 genus, 1 species)

Asarum caulescens Maxim. 'Futabaaoi'
Tricolpate, pericolpate (4-5 colpate) monad; exine 1.0-2.0 μm thick; sexine verrucate, gemmate, gemmae 1.5-2.0 μm wide; colpi ragged, acute at ends, 10-15 μm long; grains circular; grains 36-42-51 μm; flowering in Mar-May. (*S. Tugaru and T. Takahashi 7985*; Loc. K)

Asclepiadaceae (3 genera, 4 species)

Pollinia; 2 similar pollinia per pollinarium, pollinia united by 2 caudicles to a central corpusculum; grains inaperturate monad; flowering in Jul-Sep.
ref. 1, 3.

Balsaminaceae (1 genus, 2 species)

Stephanocolpate (4 colpate) monad; exine 1.0 μm thick; sexine reticulate, lumina 0.5-2.0 μm wide; colpi 6.0 μm long, 0.5 μm wide; depressed oval in equatorial view; rectangular in polar view; polar axis 10-17 μm, equatorial axis 25-32 μm × 13-23 μm, oblate; flowering in Jul-Oct.

1a. Grains larger, shorter equatorial axis >20 μm, >1.5 μm wide lumina present ..... *Impatiens noli-tangere*
1b. Grains smaller, shorter equatorial axis <18 μm, lumina <1.5 μm wide ..... *I. textori*

Impatiens noli-tangere L. 'Kitsurifune'
Lumina 1.0-2.0 μm wide; polar axis 12-15-17 μm, equatorial axis 26-27-29 μm × 20-21-23 μm; flowering in Jul-Sep. (*T. Takahashi 1337*; Loc. K)

I. textori Miq. 'Tsurifunesou'
Lumina 0.5-1.5 μm wide; polar axis 10-12-14 μm, equatorial axis 25-29-32 μm × 13-16-18 μm; flowering in Aug-Oct. (*S. Kitamura s.n.*; Loc. K)

Berberidaceae (3 genera, 3 species)

Berberis (1 species)
Berberis thunbergii DC. 'Megi'
Syncolpate (1-3 colpate) monad; exine 2.0 μm thick; sexine reticulate; colpi irregularly surrounding the grain; grains circular; grains 26-35 μm; flowering in Apr-May. (ref. 4)

Caulophyllum and *Epimedium* (2 species)
Tricolpate monad; exine 2.0-2.5 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide; colpi acute at ends, ragged, margo thinned; oval in equatorial view, circular in polar view; polar axis 26-45 μm, equatorial axis 22-43 μm, prolate; flowering in Apr-Jun.
ref. *Caulophyllum robustum* Maxim., 'Ruiyoubotan' (Apr-Jun): 4.

1a. Equatorial axis >29 μm, polar axis >36 μm ..... *Caulophyllum robustum*
1b. Equatorial axis <29 μm, polar axis <36 μm ..... *Epimedium sempervirens*

Epimedium sempervirens Nakai 'Tokiwaikarisou'
Exine 2.0 μm thick; lumina 0.5 μm wide; colpi verrucate, apocolpium 3.0-4.0 μm wide; polar axis 26-30-35 μm, equatorial axis 22-24-27 μm, P/E ratio 1.10-1.24-1.48; flowering in Apr-May. (*M. Wakabayashi 292*; Loc. A)

Betulaceae (3 genera, 6 species)

Triporate, stephanoporate (4-6 porate) monad; exine 1.0-1.7 μm thick; sexine scabrate, rugulate; pori circular 1.5-2.0 μm wide, with annuli or vestibulum; oval in equatorial view, circular, semiangular in polar view; polar axis 16-27 μm, equatorial axis 21-33 μm, oblate; flowering in Mar-May.
ref. *Betula grossa* Sieb. et Zucc., 'Mizume' (Apr): 3; *Carpinus cordata* Bl., 'Sawashiba' (Apr-May): 4; C. tschonoskii Maxim., 'Inushide' (Apr-May): 4.

1a. Pori with vestibulum ..... *Betula grossa*
1b. Pori with annuli
  2a. Grains 5-6 porate ..... *Carpinus tschonoskii*
  2b. Grains 3-4 porate
    3a. Equatorial axis <24 μm, polar axis <20 μm, annuli formed by both endexine and ektexine, semiangular in polar view ..... *Corylus sieboldiana*
    3b. Equatorial axis >24 μm, polar axis >20 μm, annuli formed by ektexine, circular in polar view ..... *Carpinus cordata, Carpinus japonica, C. laxiflora*

Carpinus japonica Blume 'Kumashide'
Triporate, stephanoporate (4 porate) monad; exine 1.3-1.6 μm thick; pori circular 2.0 μm wide, anulis formed by ektexine, 1.5 μm high, 5.0-6.0 μm wide; circular in polar view; polar axis 22-24-27 μm, equatorial axis 25-27-32 μm, P/E ratio 0.78-0.87-0.91; flowering in Apr-May. (*H. Nagamasu 4468*; Loc. A)

C. laxiflora (Sieb. et Zucc.) Blume 'Akashide'
Triporate, stephanoporate (4 porate) monad; exine 1.0 μm thick; pori circular 1.5-2.0 μm wide, annuli formed by ektexine, 1.5-2.0 μm high, 6.0-8.0 μm wide; circular in polar view; polar axis 20-23-25 μm, equatorial axis 22-26-29 μm, P/E ratio 0.76-0.87-0.95; flowering in Apr-May. (*H. Nagamasu 4464*; Loc. A)

Corylus sieboldiana Blume 'Tsunohashibami'
Triporate monad; exine 1.3-1.7 μm thick; pori circular 1.5-2.0 μm, annuli formed by both ektexine and endexine, 2.0-2.5 μm high, 10 μm wide; semiangular in polar view; polar axis 16-18-20 μm, equatorial axis 21-23-24 μm, P/E ratio 0.73-0.80-0.89; flowering in Mar-May. (*H. Nagamasu 4497*; Loc. A)

Boraginaceae (3 genera, 4 species)

Heterocolpate (with 3 colpori and 3 furrows) monad; exine 1.0 μm thick; sexine psilate; constricted, compressed oval in equatorial view, hexagonal, lobate in polar view; polar axis 8-12 μm, equatorial axis 5-7 μm, prolate; flowering in Apr-Nov.
ref. *Bothriospernum tenellum* (Hornem.) Fisch. et C. A. Mey., 'Hanaibana' (Apr-Nov): 3; *Cynoglossum asperrimum* Nakai, 'Onirurisou' (Jun-Aug): 1; *C. zeylanicum* (Vahl) Thunb., 'Oorurisou' (Jul-Aug): 2; *Omphalodes japonica* (Thunb.) Maxim., 'Yamarurisou' (Apr-May): 1.

Buxaceae (1 genus, 1 species)

Pachysandra terminalis Sieb. et Zucc. 'Fukkisou'
Periporate (10-20 porate) monad; exine 3.5-4.5 μm thick; sexine reticulate, lumina 3.0-6.0 μm wide, muri 2.0 μm wide, dupri-tripricolumellate; pori circular 2.0 μm wide; grains circular; grains 34-38-43 μm; flowering in Apr-May. (*H. Imai s.n.*; Loc. H)

Campanulaceae (5 genera, 6 species)

Adenophora, Campanula and *Peracarpa* (4 species)
Triporate, stephanoporate (4-5 porate) monad; exine 1.6-1.8 μm thick; sexine echinate, echini <1.0 μm high; pori circular 4.0-5.5 μm wide, annuli dropped inside; oval in equatorial view, circular in polar view; grains 24-43 μm, spherical; flowering in Jun-Oct.
ref. *Adenophora remotiflora* (Sieb. et Zucc.) Miq. 'Sobana' (Aug): 1; *A. triphylla* (Thunb.) A. DC., 'Tsuriganeninjin' (Aug-Oct): 4; *Peracarpa carnosa* (Wall.) Hook. fil. et Thomson, 'Tanigikyou' (Jun-Aug): 3.

1a. Grains >35 μm ..... *Adenophora triphylla*
1b. Grains <35 μm ..... *Campanula punctata*

Campanula punctata Lam. 'Hotarubukuro'
Triporate, stephanoporate (4 porate) monad; exine 1.6 μm thick; echini 1.0 μm high, <0.5 μm wide; pori circular 4.0-5.0 μm wide, annuli 2.0-3.0 deep; polar axis 25-29-33 μm, equatorial axis 26-31-35 μm, P/E ratio 0.88-0.94-1.05; flowering in Jun-Jul. (*K. Nagai 25460*; Loc. K)

Codonopsis (1 species)

Codonopsis lanceolata (Sieb. et Zucc.) Trautv. 'Tsuruninjin'
Stephanocolpate (7-10 colpate) monad; exine 2.0-3.0 μm thick; sexine scabrate; colpi ragged; oval in equatorial view, circular in polar view; grains 27-35 μm, spherical; flowering in Aug-Oct. (ref. 4)

Lobelia (1 species)

Lobelia chinensis Lour. 'Mizokakushi'
Tricolporate monad; exine 1.2 μm thick; sexine scabrate; colpi rounded at ends, long, margo thickened; pori lalongate; oval in equatorial view, circular in polar view; polar axis 23-29 μm, equatorial axis 19-26 μm, prolate; flowering in Jun-Oct. (ref. 4)

Caprifoliaceae (5 genera, 11 species)

Abelia and *Lonicera* (2 species)
Tricolpate, stephanocolpate (4-5 colpate) monad; exine 2.0-3.0 μm thick; sexine echinate, echini 0.5-1.5 μm high; colpi 16-20 μm long; oval in equatorial view, semiangular in polar view; polar axis 46-60 μm, equatorial axis 47-74 μm, oblate-spherical; flowering in Apr-Jul.

ref. *Abelia serrata* Sieb., et Zucc. 'Kotsukubaneutsugi' (Apr-Jun): 4; *Lonicera japonica* Thunb., 'Suikazura' (May-Jul): 4.

1a. Echini smaller <1.0 μm high and dense >20 per 10 × 10 μm² ..... *Abelia serrata*
1b. Echini bigger >1.0 μm high and scatter <10 per 10 × 10 μm² ..... *Lonicera japonica*

Sambucus and *Viburnum* (9 species)

Tricolporate monad; exine 1.1-2.5 μm thick; sexine reticulate, lumina <0.5-2.0 μm wide; colpi acute at ends, apocolpium 2.0-9.0 μm wide, margo thinned; pori lalongate <0.5-3.0× 3.0-8.0 μm, costae 1.0-3.0 μm thick; oval in equatorial view, circular in polar view; polar axis 16-29 μm, equatorial axis 15-25 μm, prolate-spherical; flowering in Apr-Aug.

ref. *Sambucus chinensis* Lindley, 'Sokuzu' (Jul-Aug): 4; *Viburnum dilatatum* Thunb., 'Gamazumi' (May-Jun): 4; V. *phlebotricum* Sieb. et Zucc., 'Otokoyouzome' (Apr-Jun): 4.

1a. Pori <5 μm long, exine <1.5 μm thick, lumina <0.5 μm wide ..... *Sambucus racemosa*
1b. Pori >5 μm long, exine >1.5 μm thick, lumina >0.5 μm wide
2a. Apocolpium <4.0 μm wide, costae <1.0 μm thick, lumina <1.0 μm wide ..... *Viburnum furcatum*
2b. Apocolpium 4.0-5.0 μm wide, costae 1.0-1.5 μm thick, lumina 1.0-1.5 μm wide ..... *V. plicatum, V. erosum*
2c. Apocolpium >5.0 μm wide, costae >1.5 μm thick, lumina 1.0-2.0 μm wide
3a. Polar axis <24 μm, equatorial axis <21 μm, apocolpium <7.0 μm wide, costae <2.0 μm thick, lumina <1.5 μm wide ..... *V. wrightii*
3b. Polar axis >24 μm, equatorial axis >21 μm, apocolpium >7.0 μm wide, costae >2.0 μm thick, >1.5 μm wide lumina present ..... *V. urceolatum*

Sambucus racemosa L. 'Niwatoko'

Exine 1.1 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 3.0-4.0 μm wide; pori lalongate 0.5 × <3.0-4.0 μm, costae 1.0 μm thick; polar axis 16-19-20 μm, equatorial axis 15-16-18 μm, P/E ratio 1.00-1.13-1.33; flowering in Apr-May. (*M. Ito and A. Iwami 3371*; Loc. S)

Viburnum erosum Thunb. 'Kobanogamazumi'

Exine 2.1 μm thick; lumina 1.0-1.5 μm wide, muri simplicolumellate; colpi constricted at equator, apocolpium 4.0-5.0 μm wide; pori lalongate 2.0-2.5 × 7.0 μm, costae 1.0-1.5 μm thick; polar axis 20-22-25 μm, equatorial axis 16-20-23 μm, P/E ratio 0.94-1.14-1.43; flowering in Apr-Jun. (*M. Hiroe 16259*; Loc. K)

V. furcatum Blume ex Maxim. 'Ookamenoki'

Exine 2.3 μm thick; lumina 0.5-1.0 μm wide, muri simplicolumellate; apocolpium 2.0-4.0 μm wide; pori lalongate 2.5-3.0 × 7.0-8.0 μm, costae 1.0 μm thick; polar axis 18-21-23 μm, equatorial axis 20-21-23 μm, P/E ratio 0.93-0.98-1.07; flowering in Apr-May. (*K. Ueda et al. 527*; Loc. A)

V. plicatum Thunb. 'Yabudemari'

Exine 2.5 μm thick; lumina 1.0-1.5 μm wide, muri simplicolumellate; apocolpium 4.0-

5.0 μm wide; pori lalongate 2.0 × 7.0 μm, costae 1.5 μm thick; polar axis 17-20-22 μm, equatorial axis 17-19-20 μm, P/E ratio 1.00-1.05-1.15; flowering in May-Jun. (*H. Takahashi 931*; Loc. A)

V. urceolatum Sieb. et Zucc. 'Miyamashigure'
Exine 2.0 μm thick; lumina 1.0-2.0 μm wide, muri simplicolumellate 0.5 μm wide, apocolpium 7.0-9.0 μm wide; pori lalongate 2.0-3.0 × 8.0 μm, costae 2.0-3.0 μm thick; polar axis 23-27-29 μm, equatorial axis 20-23-25 μm, P/E ratio 1.00-1.15-1.44; flowering in Jun-Aug. (*N. Satomi 21867*; Loc. T)

V. wrightii Miq. 'Miyamagamazumi'
Exine 2.0 μm thick; lumina 1.0-1.5 μm wide, muri simplicolumellate <0.5 μm wide, apocolpium 5.0-7.0 μm wide; pori lalongate 2.0-3.0 × 6.0-8.0 μm, costae 1.5-2.0 μm thick; polar axis 20-22-24 μm, equatorial axis 16-19-22 μm, P/E ratio 0.94-1.14-1.39; flowering in Apr-Jun. (*G. Murata 7070*; Loc. A)

Weigela (1 species)

Weigela hortensis (Sieb. et Zucc.) K. Koch 'Taniutsugi'
Triporate monad; exine 1.0 μm thick; sexine echinate, echini 2.0-5.0 μm high; pori circular 5.0-8.0 μm wide, annuli 3.0 μm thick, 1.5 μm wide; oval in equatorial view, circular in polar view; polar axis 33-41-47 μm, equatorial axis 37-44-50 μm, P/E ratio 0.85-0.92-0.97; flowering in May-Jun. (*H. Takahashi s.n.*; Loc.A)

Caryophyllaceae (5 genera, 8 species)

Periporate (6-30 porate) monad; exine 2.3-3.0 μm; sexine baculate, bacula forming tectum on top, tectum scabrate; pori circular 2.0-7.0 μm, annuli thinned; grains circular; grains 21-59 μm; flowering in Apr-Oct.
ref. *Cerastium holosteoides* Fries, 'Miminagusa' (May-Jun): 4; *Cucubalus baccifer* L., 'Nanbanhakobe' (Jul-Oct): 3; *Lychnis miqueliana* Rohrb., 'Fushigurosennou' (Jul-Oct): 4; *Sagina japonica* (Sw.) Ohwi, 'Tsumekusa' (Apr-Jul): 4; *Sterallia alsine* Grimm, 'Nominofusuma' (Apr-Oct): 1; *S. diversiflora* Maxim., 'Sawahakobe' (May-Jul): 1; *S. media* (L.) Villars, 'Hakobe' (Apr-Sep): 3.

1a. Grains >40 μm ..... *Lychnis miqueliana*
1b. Grains <40 μm
  2a. Pori >5.0 μm wide ..... *Cerastium holosteoides*
  2b. Pori <5.0 μm wide ..... *Sagina japonica, Stellaria monosperma*

Stellaria monosperma Buch.-Hamilt. var. *japonica* Maxim. 'Ooyamahakobe'
Periporate (12-15 porate) monad; exine 2.3 μm thick; bacula 1.2 μm high, 0.5-1.0 μm wide; pori circular 3.0-4.0 μm wide, annuli 0.5 μm wide; grains 27-31-35 μm; flowering in Aug-Oct. (*G. Nakai 5598*; Loc. A)

Celastraceae (2 genera, 6 species)

Tricolporate monad; exine 2.4-3.8 μm thick; sexine reticulate, lumina 0.5-2.0 μm wide, muri simplicolumellate; colpi acute at ends, apocolpium 5.0-13 μm wide, margo thinned; pori circular, lalongate 3.0-6.0 μm wide, costae 1.5-2.5 μm thick; oval in equatorial view, circular in polar view; polar axis 17-32 μm, equatorial axis 17-33 μm, spherical; flowering in May-Jul.
ref. *Euonymus melananthus* Fr. et Sav., 'Sawadatsu' (Jun-Jul): 1.

1a. Equatorial axis >27 μm, polar axis >27 μm, exine >3.3 μm thick, apocolpium >10 μm wide ..... *Euonymus oxyphyllus*
1b. Equatorial axis <25 μm, polar axis <27 μm, exine <3.3 μm thick, apocolpium <9.0 μm wide
2a. Margo slightly prominent in equator, >2.0 μm thick costae present ..... *Celastrus orbiculatus*
2b. Margo flat, costae <2.0 μm thick
3a. Pori <4.0 μm wide, lumina <1.0 μm wide, apocolpium >8.0 μm wide ..... *E. fortunei*
3b. Pori >4.0 μm wide, lumina >1.0 μm wide, apocolpium <8.0 μm wide
4a. Pori circular, lalongate >5.0 μm wide ..... *E. sieboldianus*
4b. Pori circular <5.0 μm wide ..... *E. alatus*

Celastrus orbiculatus Thunb. 'Tsuruumemodoki'
Exine 2.6 μm thick; lumina 0.5-1.0 μm wide, muri simplicolumellate 0.5 μm wide; apocolpium 5.0-7.0 μm wide, colpi equatorial prominent, <0.5 μm high; pori circular 3.0-4.0 μm wide, costae 1.5-2.5 μm thick; polar axis 20-22-27 μm, equatorial axis 18-23-25 μm, P/E ratio 0.89-0.93-1.20; flowering in May-Jun. (*G. Koidzumi s.n.*; Loc. K)

Euonymus alatus Sieb. var. *microphyllus* (Nakai) Hara 'Kobamayumi'
Exine 2.9 μm thick; lumina 1.0-2.0 μm wide, muri simplicolumellate 0.5 μm wide; apocolpium 6.0-8.0 μm wide; pori circular 4.0-4.5 μm wide, costae 1.5 μm thick; polar axis 20-22-24 μm, equatorial axis 18-21-23 μm, P/E ratio 0.94-1.05-1.13; flowering in May-Jun. (*G. Murata et al. s.n.*; Loc. A)

E. fortunei (Turcz.) Hand.-Mazz. 'Tsurumasaki'
Exine 2.4 μm thick; lumina 0.5-1.0 μm wide, muri simplicolumellate; apocolpium 9.0 μm wide; pori lalongate, circular 3.0 × 3.0-4.0 μm, costae 1.5-2.0 μm thick; polar axis 17-20-23 μm, equatorial axis 17-21-23 μm, P/E ratio 0.88-0.99-1.08; flowering in Jun-Jul. (*G. Koidzumi s.n.*; Loc. K)

E. oxyphyllus Miq. 'Tsuribana'
Exine 3.8 μm thick; lumina 1.0-1.5 μm wide, muri simplicolumellate; apocolpium 10-13 μm wide; pori circular 3.0-4.0 μm wide, costae 1.5 μm thick; polar axis 27-29-32 μm, equatorial axis 27-30-33 μm, P/E ratio 0.88-0.96-1.04; flowering in May-Jun. (*G. Murata s.n.*; Loc. K)

E. sieboldianus Blume 'Mayumi'
Exine 2.5 μm thick; lumina 1.0-2.0 μm wide, muri simplicolumellate; apocolpium 7.0

μm wide; pori circular, lalongate 5.0 × 6.0 μm; polar axis 20-22-24 μm, equatorial axis 20-22-24 μm, P/E ratio 0.89-1.01-1.06; flowering in May-Jun. (*Anonymous s.n.*; Loc. K)

Cephalotaxaceae (1 genus, 1 species)

Chephalotaxus harringtonia (Knight) K. Koch var. *nana* (Nakai) Rehder 'Haiinugaya'

Inaperturate monad; exine 1.0-1.5 μm thick; sexine scabrate, verrucate; slightly ridged in proximal face, circular in polar view; grains 21-24-28 μm; flowering in Mar-Apr. (*G. Murata 20941*; Loc. K)

Cercidiphyllaceae (1 genus, 1 species)

Cercidiphyllum japonicum Sieb. et Zucc. 'Katsura'

Tricolpate monad; exine 1.5-2.0 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi rounded at ends, wide, sunken, apocolpium 12-16 μm wide, margo thinned; oval in equatorial view, semiangular in polar view; polar axis 21-26-31 μm, equatorial axis 20-24-29 μm, P/E ratio 0.89-1.07-1.20; flowering in Mar-May. (*T. Makino MAK 120595*; Loc. Saitama Pref.)

Chenopodiaceae (1 genus, 1 species)

Chenopodium album L. 'Shiroza'

Periporate (40-50 porate) monad; exine 2.0 μm thick; sexine baculate, bacula forming tectum on top, tectum scabrate; pori circular 1.5-2.0 μm, annuli present; grains circular; grains

15-17-19 μm; flowering in Sep-Oct. (*S. Hosomi 7317*; Loc. K)

Chloranthaceae (1 genus, 1 species)

Chloranthus serratus (Thunb.) Roem. et Schult. 'Futarishizuka'

Stephanocolpate (5-6 colpate) monad; exine 1.8 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide; colpi ragged, apocolpium width variable; oval in equatorial view, circular in polar view; polar axis 20-21-23 μm, equatorial axis 20-22-23 μm wide, P/E ratio 0.88-0.98-1.13 (n=8); flowering in May. (*M. Tagawa s.n.*; Loc. K)

Clethraceae (1 genus, 1 species)

Clethra barvinervis Sieb. et Zucc. 'Ryoubu'

Tricolporate monad; exine 1.5 μm thick; sexine psilate; colpi acute at ends, equatorial prominent, apocolpium 6.0-7.0 wide; pori lalongate 2.5-7.0 μm wide, costae 1.5 μm thick; oval in equatorial view, circular in polar view; polar axis 16-18-20 μm, equatorial axis 17-20-23 μm, P/E ratio 0.82-0.92-1.15; flowering in Jul-Aug. (*M. Tagawa s.n.*; Loc. A)

Commelinaceae (2 genera, 2 species)

Damaged by acetolysis; monocolpate monad; exine 1.0-2.5 μm thick; sexine echinate, verrucate, echini 0.5-1.5 μm high; grains elliptic; polar axis 17-35 μm, equatorial axis 32-48 μm; flowering in Jul-Oct.
ref. *Commelina communis* L., 'Tsuyukusa' (Jul-Sep): 4; *Murdannia keisak* (Hassk.) Hand.-Mazz., 'Ibokusa' (Sep-Oct): 4.

1a. Polar axis >25 μm, sexine echinate ..... *Commelina communis*
1b. Polar axis <25 μm, sexine verrucate ..... *Murdannia keisak*

Compositae (35 genera, 48 species)

Lactucoideae (6 genera, 9 species)
Fenestrate monad; exine 4.0-5.0 μm thick; sexine echinate, echini 1.5-2.5 μm high; echinate ridges forming a coarse network over the grain surface separating lacunae which are arranged in a geometric pattern; oval, hexagonal in equatorial view, triangular, hexagonal in polar view; grains 16-35 μm, spherical; flowering in Apr-Nov.
ref. *Ixeris storonifera* A.Gray, 'Iwanigana' (Apr-Jul): 2; *Lactuca indica* L., 'Akinonogeshi' (Aug-Nov): 3; *L. raddeana* Maxim., 'Yamanigana' (Aug-Sep): 1; *L. sororia* Miq., 'Murasakinigana' (Jun-Aug): 1; *Lapsana apogonoides* Maxim., 'Koonitabirako' (Apr-May): 1; *Picris hieracoides* L., 'Kouzorina' (May-Oct): 4; *Taraxacum officinale* Weber, 'Seiyoutanpopo' (Apr-Nov): 4; *Youngia japonica* (L.) DC., 'Onitabirako' (May-Oct): 4.

Ixeris dentata (Thunb.) Nakai 'Nigana'
Exine 4.0-4.5 μm thick; echini 2.0 μm high; echinate ridge 4.0 μm wide; grains 30-33-35 μm (n=5); flowering in May-Jul. (*S. Kitamura s.n.*; Loc. K)

Asteroideae (27 genera, 39 species)
Tricolporate monad; exine 1.5-5.0 μm thick; sexine echinate, verrucate, echini 0.5-5.5 μm high; colpi acute at ends; pori lalongate, circular 1.0-12 μm wide, costae 0.5-3.0 μm thick; oval in equatorial view, circular in polar view; polar axis 13-53 μm, equatorial axis 15-52 μm, oblate-spherical-prolate; flowering in Apr-Nov.
ref. *Ainsliaea apiculata* Sch. Bip., 'Kikkouhaguma' (Sep-Oct): 1; *Ambrosia artemisiaefolia* L., 'Butakusa' (Jul-Oct): 4; *Anaphalis margaritacea* (L.) Benth. et Hook. fil., 'Hosobanoyamahahako' (Aug-Sep): 4; *Arnica mallatopus* (Fr. et Sav.) Makino, 'Choujigiku' (Aug-Oct): 1; *Artemisia japonica* Thunb., 'Otokoyomogi' (Aug-Nov): 4; *Aster scaber* Thunb., 'Shirayamagiku' (Aug-Oct): 4; *Bidens frondosa* L., 'Amerikasendangusa' (Sep-Oct): 4; *Carpesium abrotanoides* L., 'Yabutabako' (Sep-Nov): 4; *Centipeda minima* (L.) A. Br. et Ascherson, 'Tokinsou' (Jul-Oct): 4; *Cirsium japonicum* DC., 'Noazami' (May-Aug): 4; *Cirsium nipponicum* (Maxim.) Makino, 'Yoshinoazami' (Aug-Oct): 4; *Erechtites hieracifolia* (L.) Raf. 'Dandoborogiku' (Sep-Oct): 4; *Erigeron canadensis* L., 'Himemukashiyomogi'

(Aug-Oct): 1; *Eupatorium chinense* L., 'Hiyodoribana' (Aug-Oct): 3; *E. lindleynum* DC., 'Sawahiyodori' (Aug-Oct): 4; *Gnaphalium affine* D. Don, 'Hahakogusa' (Apr-Jun): 3; *G. japonicum* Thunb., 'Chichikogusa' (May-Oct): 1; *Kalimeris pinnatifida* (Maxim.) Kitam., 'Yuugagiku' (Jul-Oct): 1; *Leibnitzia anandria* (L.) Turcz., 'Senbon'yari' (Apr-Oct): 4; *Ligularia fischerii* (Ledeb.) Turcz., 'Otakarakou' (Jul-Oct) 1; *Pertya robusta* (Maxim.) Beauv., 'Kashiwabahaguma' (Sep-Nov): 1; *P. scadens* Sch. Bip., 'Kouyabouki' (Sep-Oct): 3; *Senesio nikoensis* Miq., 'Sawagiku' (Jun-Aug): 4; *Synurus palmatopinnatifidus* (Makino) Kitam., 'Kikubayamabokuchi' (Sep-Nov): 1.

1a. Polar axis >36 μm
  2a. Echini >4.0 μm high, >5.0 μm wide ..... *Circium kagamontanum*
  2b. Echini <1.0 μm high, <2.0 μm wide, exine thicker in polar area. ..... *Ainsliaea acerifolia*
1b. Polar axis <36 μm
  3a. Echini, verrucae <1.0 μm high
    4a. Polar axis >22 μm, pori lalongate, costae >2.0 μm thick ..... *Adenocaulon himalaicum*
    4b. Polar axis <19 μm, pori circular, costae <2.0 μm thick ..... *Artemisia princeps*
  3b. Echini >1.5 μm high
    5a. Pori circular
      6a. Equatorial axis <19 μm, pori indistinct <1.5 μm wide ..... *Stenactis annus*
      6b. Equatorial axis 22-27 μm, pori 1.5-3.0 μm wide ..... *Cacalia delphiniifolia*
      6c. Equatorial axis >27 μm, pori >3.0 μm wide ..... *Aster glehnii*
    5b. Pori lalongate
      7a. Colpi short, <10 μm long
        8a. Echini <3.0 μm high ..... *Solidago virgaurea*
        8b. Echini >3.0 μm high ..... *Petasites japonicus, Sigesbeckia orientalis*
      7b. Colpi long, >10 μm long
        9a. Equatorial axis >28 μm ..... *Cacalia nikomontana*
        9b. Equatorial axis <28 μm
          10a. Pori >7.5 μm long ..... *Carpesium divaricatum*
          10b. Pori 5.0-7.5 μm long ..... *Kalimeris yomena, Miyamayomena savatieri*
          10c. Pori <5.0 μm long ..... *Aster ageratoides*

Adenocaulon himalaicum Edgew. 'Nobuki'

Exine 2.0-3.0 μm thick; sexine echinate, echini 0.5-1.0 μm high; apocolpium 7.0 μm wide; pori lalongate 2.0 × 12 μm, ragged, costae 3.0 μm thick; polar axis 22-26-29 μm, equatorial axis 22-25-27 μm, P/E ratio 0.94-1.08-1.17; flowering in Aug-Oct. (*S. Okamoto s.n.*; Loc. A)

Ainsliaea acerifolia Sch. Bip. 'Okumomijihaguma'

Exine 3.5 μm thick, 5.0 μm thick in polar area; sexine echinate, echini 0.5 μm high, 1.0 μm wide; colpi 22 μm long, apocolpium 19 μm wide; pori lalongate 10×12-13 μm, costae 0.5-1.0 μm thick; polar axis 36-39-42 μm, equatorial axis 31-33-35 μm, P/E ratio 1.11-1.18-1.24; flowering in Aug-Oct. (*Y. Araki s.n.*; Loc. A)

Artemisia princeps Pamp. 'Yomogi'

Exine 3.0 μm thick; sexine verrucate, verrucae <0.5 μm high, 0.5-1.0 μm wide; apocolpium 5.0 μm wide; pori circular 3.0 μm wide, costae 1.0 μm thick; polar axis

17-18-19 μm, equatorial axis 17-20-23 μm, P/E ratio 0.78-0.90-1.00; flowering in Sep-Oct. (*M. Tagawa 456*; Loc. K)

Aster ageratoides Turcz. ssp. *ovatus* Fr. et Sav. 'Nokongiku'
Exine 1.9 μm thick; sexine echinate, echini 3.0-3.5 μm high, 3.0-4.0 μm wide; apocolpium 8.0-11 μm wide; pori lalongate 2.5-3.0 × 4.0-5.0 μm, costae 1.0-1.5 μm thick; polar axis 20-22-24 μm, equatorial axis 20-22-25 μm, P/E ratio 0.88-0.99-1.12; flowering in Aug-Nov. (*S. Okamoto s.n.*; Loc. K)

A. glehnii Fr. Schm. 'Gomana'
Exine 2.5-3.0 μm thick; sexine echinate, echini 5.0 μm high, 3.0-3.5 μm wide; colpi 7.0-8.0 μm long; pori circular 4.0-5.0 μm wide, costae 1.0 μm thick; polar axis 26-28-30 μm, equatorial axis 27-29-30 μm, P/E ratio 0.91-0.96-1.05; flowering in Sep-Oct. (*S. Okamoto s.n.*; Loc. A)

Cacalia delphiniifolia Sieb. et Zucc. 'Momijigasa'
Exine 2.5-3.0 μm thick; sexine echinate, echini 4.0 μm high, 3.5-4.0 μm wide; colpi 8.0-9.0 μm long; pori circular 2.0 μm wide; polar axis 22-26-28 μm, equatorial axis 22-25-27 μm, P/E ratio 0.95-1.03-1.11 (n=19); flowering in Aug-Sep. (*G. Murata 18952*; Loc. S)

C. nikomontana Matsum. 'Ookanikoumori'
Exine 3.9 μm thick; sexine echinate, echini 3.5-4.0 μm high, 3.0 μm wide; colpi 11-12 μm long; pori lalongate 2.5-3.5 × 7.0-9.0 μm, costae 1.0 μm thick; polar axis 27-31-35 μm, equatorial axis 28-30-33 μm, P/E ratio 0.95-1.04-1.13; flowering in Aug-Oct. (*S. Kitamura s.n.*; Loc. A)

Carpesium divaricatum Sieb. et Zucc. 'Gankubisou'
Exine 2.0-2.5 μm thick; sexine echinate, echini 3.0 μm high, 2.5-3.0 μm wide; colpi 12 μm long; pori lalongate 3.0 × 8.0 μm; polar axis 18-22-24 μm, equatorial axis 21-22-24 μm, P/E ratio 0.88-0.97-1.00; flowering in Aug-Oct. (*K. Iwatsuki 5514*; Loc. A)

Circium kagamontanum Nakai 'Kaganoazami'
Exine 3.5-4.0 μm thick; sexine echinate, echini 4.5 μm high, 7.0 μm wide; colpi 20 μm long; pori lalongate 7.0-9.0 × 9.0-12 μm; polar axis 36-41-48 μm, equatorial axis 38-43-52 μm, P/E ratio 0.92-0.96-1.00; flowering in Aug-Oct. (*S. Kitamura s.n.*; Loc. A)

Kalimeris yomena Kitam. 'Yomena'
Exine 2.0 μm thick; sexine echinate, echini 2.5-3.0 μm high; colpi 13 μm long, apocolpium 11-13 μm wide; pori lalongate 3.0 × 7.0-5.0 μm; polar axis 17-21-24 μm, equatorial axis 20-22-25 μm, P/E ratio 0.87-0.96-1.12; flowering in Jul-Oct. (*T. Tsuchiya 2121*; Loc. K)

Miyamayomena savatieri (Makino) Kitam. 'Miyamayomena'
Exine 1.9 μm thick; sexine echinate, echini 3.0-3.5 μm high, 3.5 μm wide; colpi 13-16

μm long, apocolpium 12 μm wide; pori lalongate 2.0-2.5 × 7.0-5.0 μm, costae 1.5 μm thick; polar axis 18-22-27 μm, equatorial axis 18-22-27 μm, P/E ratio 0.83-1.00-1.14; flowering in May-Jun. (*G. Koidzumi s.n.*; Loc. K)

Petasites japonicus (Sieb. et Zucc.) Maxim. 'Fuki'
Exine 1.5-2.0 μm thick; sexine echinate, echini 3.5-4.0 μm high; colpi 8.0 μm long; pori lalongate 4.0-4.5 × 7.0 μm; polar axis 21-23-24 μm, equatorial axis 23-25-28 μm, P/E ratio 0.85-0.91-0.95; flowering in Apr-May. (*G. Murata s.n.*; Loc. K)

Sigesbeckia orientalis L. 'Komenamomi'
Exine 2.0 μm thick; sexine echinate, echini 3.5-4.0 μm high; colpi 9.0-10 μm long; pori lalongate 3.5 × 8.0-9.0 μm; polar axis 21-22-23 μm, equatorial axis 24 μm, P/E ratio 0.89-0.93-0.95 (n=4); flowering in Sep-Oct. (*T. Takahashi 2074*; Loc. K)

Solidago virgaurea L. 'Akinokirinsou'
Exine 1.8-2.0 μm thick; sexine echinate, echini 2.0-2.5 μm high, 2.5 μm wide; colpi 8.0 μm long, apocolpium 9.0 μm wide; pori lalongate 2.0-3.5 × 5.0-6.5 μm, costae 1.0 μm thick; polar axis 16-18-20 μm, equatorial axis 17-20-22 μm, P/E ratio 0.81-0.94-1.00; flowering in Aug-Nov. (*T. Takahashi 457*; Loc. K)

Stenactis annuus (L.) Cass. 'Himejoon'
Exine 1.5-2.0 μm thick; sexine echinate, echini 1.5-2.0 μm high; colpi 13 μm long, apocolpium 4.0-8.0 μm wide; pori indistinct 1.0 μm wide; polar axis 13-16-18 μm, equatorial axis 15-17-19 μm, P/E ratio 0.78-0.93-1.00; flowering in Jun-Oct. (*S. Hosomi 6797*; Loc. K)

Convolvulaceae (2 genera, 2 species)

Calystegia (1 species)

Calystegia japonica Choisy 'Hirugao'
Periporate (10-20 porate) monad; exine 5.5 μm thick; sexine baculate; pori circular 5.0-7.0 μm wide, dropped inside; grains circular; grains 56-90 μm; flowering in Jul-Aug. (ref. 3)

Cuscuta (1 species)

Cuscuta japonica Chisy 'Nenashikazura'
Tricolpate, stephanocolpate (4 colpate) monad; exine 2.5 μm thick; sexine baculate, bacula forming tectum on top; oval in equatorial view, circular in polar view; polar axis 32-36 μm, equatorial axis 28-36 μm, spherical; flowering in Aug-Oct. (ref. 4)

Cornaceae (4 genera, 5 species)

Aucuba (1 species)

Aucuba japonica Thunb. 'Himeaoki'
Tricolporate monad; exine 3.0-3.5 μm thick; sexine clavate, clavae 0.5-1.0 μm wide,

2.5-3.0 μm high; colpi constricted at equator, apocolpium 18 μm wide; pori indistinct, circular 4.0-5.0 μm wide, costae 3.0-4.0 μm thick; oval in equatorial view, circular in polar view; polar axis 32-38-43 μm, equatorial axis 32-40-44 μm, P/E ratio 0.88-0.97-1.03; flowering in Apr-May. (*Y. Inamasu 45*; Loc. A)

Benthamidia (1 species)

Benthamidia japonica (Sieb. et Zucc.) Hara 'Yamaboushi'
Tricolporate monad; exine 1.0-1.5 μm thick; sexine verrucate, scabrate; colpi acute at ends, equatorial prominent, apocolpium 6.0-7.5 μm wide, margo 4.0 μm thick, 4.0-5.0 μm wide; pori lalongate 2.0 × 3.0 μm, costae 1.5 μm thick; oval, equatorial acute oval in equatorial view, angular, semiangular in polar view; polar axis 22-24-27 μm, equatorial axis 21-24-26 μm, P/E ratio 0.91-1.03-1.17 (n=11); flowering in Jun-Jul. (*S. Okamoto s.n.*; Loc. A)

Helwingia (1 species)

Helwingia japonica (Thunb.) F. G. Dietrich 'Hanaikada'
Tricolporate monad; exine 1.3 μm thick; sexine scabrate; colpi acute at ends, constricted at equator, apocolpium 4.0-8.0 μm wide; pori indistinct, costae 1.0 μm thick; oval in equatorial view, circular in polar view; polar axis 21-25-29 μm, equatorial axis 16-20-23 μm, P/E ratio 1.05-1.25-1.47; flowering in May-Jun. (*H. Nagamasu 71*; Loc. K)

Swida (2 species)
Tricolporate monad; exine 1.0-1.8 μm thick; sexine verrucate, scabrate; colpi acute at ends, constricted at equator, apocolpium 6.0-16 μm wide, margo 3.0 μm thick, 5.0-6.0 μm wide; pori lalongate 3.0-4.0 × 4.0-8.0 μm, costae 2.0-2.5 μm thick; equatorial acute oval in equatorial view, angular in polar view; polar axis 35-53 μm equatorial axis 25-34 μm, prolate; flowering in May-Jul.

1a. Polar axis >42 μm, exine >1.4 μm thick, apocolpium >10 μm wide, pori >6.0 μm long ..... *Swida macrophylla*
1b. Polar axis <42 μm, exine <1.4 μm thick, apocolpium <10 μm wide, pori <6.0 μm long ..... *S. controversa*

Swida controversa (Hemsl.) Sojak 'Mizuki'
Exine 1.0 μm thick; apocolpium 6.0-7.0 μm wide, margo thickened, 5.0-6.0 μm wide; pori lalongate 3.0 × 4.0-5.0 μm, costae 2.0 μm thick; polar axis 35-39-43 μm, equatorial axis 25-29-32 μm, P/E ratio 1.21-1.36-1.53; flowering in May-Jun. (*G. Koidzumi s.n.*; Loc. K)

S. macrophylla (Wall.) Sojak 'Kumanomizuki'
Exine 1.4-1.8 μm thick; apocolpium 16 μm wide, margo 3.0 μm thick, 5.0-6.0 μm wide; pori lalongate 4.0 × 8.0 μm, costae 2.0-2.5 μm thick; polar axis 42-46-53 μm, equatorial axis 25-31-34 μm, P/E ratio 1.25-1.50-1.87; flowering in Jun-Jul. (*T. Takahashi 184*; Loc. K)

Crassulaceae (1 genus, 1 species)

Hylotelephium verticillatum (L.) H. Ohba 'Mitsubabenkeisou'
Tricolporate monad; exine 1.0 μm thick; sexine scabrate; colpi acute at ends, apocolpium 5.0 μm wide, margo thickened; pori circular 2.0-3.0 μm wide, costae 2.0 μm thick; oval in equatorial view, circular, semiangular in polar view; polar axis 16-17-19 μm, equatorial axis 12-14-17 μm, P/E ratio 1.08-1.25-1.40; flowering in Aug-Sep. (*M. Ito 7007*; Loc. S)

Cruciferae (5 genera, 7 species)

Tricolpate monad; exine 1.5-2.0 μm thick; sexine reticulate, lumina 0.5-2.0 μm wide; colpi long, margo thinned; oval in equatorial view, circular in polar view; grains 12-29 μm, spherical-prolate; flowering in Apr-Sep.
ref. *Arabis hirsuta* (L.) Scopoli, 'Yamahatazao' (May-Jul): 1; *Capsella bursa-pastoris* Medicus, 'Nazuna' (Apr-Jun): 4; *Cardamine flexuosa* With., 'Tanetsukebana' (Apr-Jun): 3; *C. leucantha* (Tausch) O. E. Schulz, 'Konronsou' (Apr-Jul): 4; *C. regeliana* Miq., 'Oobatanetsubana' (Apr-Jun): 2; *Rorippa indica* (L.) Hiern, 'Inugarashi' (Apr-Sep): 3.

Wasabia japonica (Miq.) Matsum. 'Wasabi'
Exine 2.0 μm thick; colpi acute at ends, apocolpium 5.0-7.0 μm wide; polar axis 16-20-23 μm, equatorial axis 10-12-15 μm, P/E ratio 1.12-1.40-1.98; flowering in Apr-May.
(*K. Ueda et al. 516*; Loc. A)

Cucurbitaceae (2 genera, 2 species)

Gynostemma (1 species)

Gynostemma pentaphylla (Thunb.) Makino 'Amachaduru'
Tricolporate monad; exine 1.5 μm thick; sexine striate; colpi acute at ends, long, margo thickened; pori lalongate; oval in equatorial view, circular in polar view; polar axis 21-24 μm, equatorial axis 16-20 μm, prolate; flowering in Aug-Sep. (ref. 4)

Melothria (1 species)

Melothria japonica (Thunb.) Maxim. ex Cogn. 'Suzumeuri'
Tricolporate monad; exine 2.0 μm thick; sexine reticulate; colpi acute at ends, long, margo thickened; pori lalongate; oval in equatorial view, circular in polar view; polar axis 43-47 μm, equatorial axis 45-49 μm, spherical; flowering in Aug-Sep. (ref. 4)

Cupressaceae (2 genera, 2 species)

Monoporate, inaperturate monad; exine 1.0-1.5 μm thick; sexine scabrate, gemmate; pori circular 2.0 μm wide, annulus absent; grains circular; grains 20-37 μm; flowering

in Apr-May.
ref. *Thujopsis dolabrata* Sieb. et Zucc., 'Asunaro' (May): 4.

Camaecyparis obtusa (Sieb. et Zucc.) Endl. 'Hinoki'
Exine 1.5 μm thick; grains 20-23-27 μm; flowering in Apr-May. (*S. Tsugaru 15577*; Loc. K)

Cyperaceae

Inaperturate, monoporate, periporate (>4 porate) monad; sexine scabrate, verrucate; 1 pore in distal face, >3 pori in equator, indistinct; grains irregular, usually pear-shaped.
ref. 1, 3, 4

Daphniphyllaceae (1 genus, 1 species)

Daphniphyllum macropodum Miq. ssp. *humile* (Maxim.) Rosenthal 'Ezoyuzuriha'
Tricolporate monad; exine 1.5 μm thick; sexine verrucate; colpi acute at ends, apocolpium 6.0-8.0 μm wide, margo thinned; pori lolongate, irregular, 5.0 × 2.0 μm wide, costae 1.0 μm thick; oval in equatorial view, circular in polar view; polar axis 15-17-20 μm, equatorial axis 16-19-22 μm, P/E ratio 0.82-0.92-1.07; flowering in Apr-May. (*G. Murata and T. Takahashi 15993*; Loc. I)

Diapensaceae (2 genera, 2 species)

Tricolporate monad; exine 1.2-1.5 μm thick; sexine reticulate; colpi long, acute at ends; oval in equatorial view, circular in polar view; polar axis 18-27 μm, equatorial axis 18-25, spherical-prolate; flowering in Apr-Jul.
ref. *Shortia uniflora* (Maxim.) Maxim., 'Iwauchiwa' (Apr-May): 1.

Schizocodon soldanelloides Sieb. et Zucc. 'Ooiwakagami'
Exine 1.2 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 4.0-6.0 μm wide; pori indistinct, lalongate 1.5 × 4.0-5.0 μm, costae 1.0-1.5 μm thick; polar axis 18-21-25 μm, equatorial axis 18-22-25 μm, P/E ratio 0.83-0.96-1.11; flowering in Apr-Jul. (*H. Nagamasu 4506*; Loc. A)

Dioscoreaceae (1 genus, 6 species)

Monocolpate monad; exine 1.0 μm thick; sexine reticulate, striate; grains circular, elliptic; polar axis 10-21 μm, equatorial axis 12-25 μm; flowering in Jun-Aug.
ref. *Dioscorea japonica* Thunb., 'Yamanoimo' (Jul-Aug): 3; *D. nipponica* Makino, 'Uchiwadokoro' (Jul-Aug): 1; *D. quinqueloba* Thunb., 'Kaededokoro' (Jul-Aug): 1; *D. septemloba* Thunb., 'Kikubadokoro' (Jun-Jul): 1; *D. tokoro* Makino, 'Onidokoro' (Jul-Aug): 3.

Dioscorea gracillima Miq. 'Tachidokoro'
Sexine striate, striae in spirals around the grain; polar axis 15-18-21 μm, equatorial axis 20-23-25 μm; flowering in Jun-Jul. (*G. Nakai 4438*; Loc. H)

Dipsacaceae (1 genus, 1 species)

Dipsacus japonicus Miq. 'Nabena'
Tricolpate monad; exine 3.5 μm thick; sexine echinate, echini 2.0 μm high; colpi ragged, 20-25 μm long, 10-12 μm wide, margo thickened, dropping inside, sometimes with operculum; oval in equatorial view, semiangular in polar view; polar axis 56-64-74 μm, equatorial axis 58-65-73 μm, P/E ratio 0.88-0.97-1.08; flowering in Aug-Sep. (*S. Okamoto s.n.*; Loc. A)

Ebenaceae (1 genus, 1 species)

Diospyros kaki Thunb. 'Kakinoki'
Tricolporate monad; exine 1.5-2.0 μm thick; sexine scabrate; colpi acute at ends, sometimes joining to another at the poles, apocolpium 8.0-12 μm wide, margo thickened; pori lalongate 4.0 × 10 μm, costae 2.5 μm thick; oval in equatorial view, semiangular in polar view; polar axis 35-38-43 μm, equatorial axis 32-36-39 μm, P/E ratio 0.90-1.04-1.15; flowering in May-Jun. (*G. Murata 68441*; Loc. K)

Elaeagnaceae (1 genus, 2 species)

Tricolporate monad; exine 1.5-2.0 μm thick; sexine scabrate; colpi narrow, short, equatorial prominant; pori circular, lalongate 5.0-8.0 μm wide, with vestibulum; oval in equatorial view, angular in polar view; polar axis 25-40 μm, equatorial axis 30-47 μm, oblate; flowering in Apr-May.
ref. *Elaeagnus umbellata* Thunb., 'Akigumi' (Apr-May): 3.

Elaeagnus multiflora Thunb. 'Tougumi'
Colpi 1.0 μm wide, apocolpium 16-23 μm wide; pori lalongate 8.0 × 6.0 μm wide, with vestibulum 6.0-8.0 μm high; polar axis 25-29-32 μm, equatorial axis 33-39-43 μm include vestibulum, P/E ratio 0.68-0.74-0.85; flowering in Apr-May.(*Anonymous s.n.* ; Loc. ?)

Ericaceae (10 genera, 17 species)

Enkianthus (1 species)

Enkianthus campanulatus (Miq.) Nicholson 'Sarasadoudan'
Tricolporate monad; exine 1.2 μm thick; sexine scabrate; colpi long, acute at ends; pori lalongate, with costae oval in equatorial view, circular, semiangular in polar view; grains 21-24 μm, spherical-prolate; flowering in May-Jun. (ref. 4)

Elliottia, Epigaea, Gaultheria, Leucothoe, Lyonia, Menziesia, Pieris, Rhododendron

and *Vaccinium* (16 species)

Tricolporate tetrads; exine 1.0-2.5 μm thick; sexine rugulate, verrucate, scabrate; colpi acute at ends, margo thickened; pori lalongate 1.0-3.0 × 3.5-8.0 μm, costae 1.0-1.5 μm thick; tetrads tetrahedal; grains, polar axis 13-29 μm, equatorial axis 18-39 μm; flowering in Apr-Aug.

ref. *Gaultheria adenothrix* (Miq.) Maxim., 'Akamono' (May-Jun): 4; *Leucothoe grayana* Maxim., 'Hanahirinoki' (Jun-Jul): 1; *Rhododendron japonicum* (A. Gray) Suringar, 'Rengetsutsuji' (May-Jun): 3; *R. keiskei* Miq., 'Hikagetsutsuji' (Apr-May) 4; *R. lagopus* Nakai, 'Saikokumitsubatsutsuji' (Apr-May) 4; *Vaccinium oldhami* Miq., 'Natsuhaze' (May-Jun): 1; *V. smalli*: A. Gray, 'Oobasunoki' (Jun-Jul): 1.

1a. Polar axis <16 μm
  2a. Pori >5.0 μm long ..... *Vaccinium hirtum*
  2b. Pori <5.0 μm long ..... *Lyonia ovalifolia*
1b. Polar axis >16 μm
  3a. Equatorial axis <26 μm
    ..... *Epigaea asiatica, Menziesia cilicalyx, Pieris japonica, V. hirtum*
  3b. Equatorial axis >26 μm ..... *Elliottia paniculata, Epigaea asiatica, Menziesia cilicalyx, Pieris japonica, Rhododendron degronianum, R. obtusum, R. reticulatum*

Elliottia paniculata (Sieb. et Zucc.) Benth. et Hook. 'Hotsutsuji'

Exine 1.9 μm thick; sexine verrucate, scabrate; colpi 7.0-8.0 μm long; pori lalongate 3.0 × 7.0-8.0 μm, costae 1.0-1.5 μm thick; grains, polar axis 17-22-28 μm, equatorial axis 26-30-33 μm; flowering in Jul-Aug. (*K. Iwatsuki 5488*; Loc. A)

Epigaea asiatica Maxim. 'Iwanashi'

Exine 2.0 μm thick; sexine verrucate, verrucae 1.0-1.5 μm wide; colpi 6.0-8.0 μm long; pori lalongate 1.5-2.0 × 5.0-6.0 μm, costae 1.0 μm thick; grains, polar axis 16-18-22 μm, equatorial axis 22-25-28 μm; flowering in May-Jun. (*G. Murata 5974*; Loc. K)

Lyonia ovalifolia (Wall.) Drude 'Nejiki'

Exine 1.7 μm thick; sexine verrucate, verrucae 0.5-1.5 μm wide; colpi 7.0 μm long; pori lalongate 1.0 × 3.5 μm, costae 1.5 μm thick; grains, polar axis 13-15-15 μm, equatorial axis 18-21-23 μm; flowering in May-Jun. (*G. Koidzumi s.n.*; Loc. K)

Menziesia cilicalyx (Miq.) Maxim. 'Tsuriganetsutsuji'

Exine 1.6-2.0 μm thick; sexine rugulate, verrucate; colpi 4.0-6.0 μm long, margo 2.0 μm thick, 2.5 μm wide; pori lalongate 1.5-3.0 × 6.0-7.0 μm; grains, polar axis 16-20-24 μm, equatorial axis 23-28-30 μm; flowering in Apr-Jun. (*H. Nagamasu 4489*; Loc. A)

Pieris japonica (Thunb.) D. Don 'Asebi'

Exine 1.9 μm thick; sexine verrucate, rugulate; colpi 8.0-10 μm long; pori lalongate 1.5-2.0 × 8.0-10 μm, costae 1.0 μm thick; grains, polar axis 16-18-20 μm, equatorial axis 23-27-30 μm; flowering in Apr-May. (*G. Murata 5974*; Loc. K)

Rhododendron degronianum Carrière 'Honshakunage'

Exine 2.2 μm thick; sexine verrucate, rugulate, verrucae 2.0 μm wide; colpi 8.0-9.0 μm long; pori lalongate 2.0-3.0 × 8.0 μm, costae 1.0-1.5 μm thick; grains, polar axis 22-25-28 μm, equatorial axis 30-35-39 μm; flowering in May-Jun. (*Anonymous s.n.*; Loc. K)

R. obtusum (Lindl.) Planchon var. *kaempferi* (Planchon) Wilson 'Yamatsutsuji'
Exine 2.5 μm thick; sexine verrucate, scabrate, verrucae 0.5-1.0 μm wide; colpi 7.0 μm long; pori lalongate 2.0-3.0 × 7.0-8.0 μm, costae 1.0-1.5 μm thick; grains, polar axis 20-22-25 μm, equatorial axis 28-32-35 μm; flowering in Apr-Jun. (*G. Murata 18019*; Loc.K)

R. reticulatum D. Don 'Kobanomitsubatsutsuji'
Exine 1.8-2.0 μm thick; sexine verrucate, rugulate; colpi 7.0-9.0 μm long, margo 2.5 μm thick, 2.0 μm wide; pori lalongate 2.5 × 8.0 μm, costae 2.5 μm thick; grains, polar axis 20-24-29 μm, equatorial axis 28-33-37 μm; flowering in Apr. (*H. Nagamasu 4491*; Loc. A)

Vaccinium hirtum Thunb. var. *pubescens* (Koidz.) Yamazaki 'Usunoki'
Exine 1.5 μm thick; sexine verrucate, verrucae 0.5-1.0 μm wide; colpi 8.0-9.0 μm long; pori lalongate 1.0-1.5 × 6.0-8.0 μm, costae 1.0-1.5 μm thick; grains, polar axis 12-15-18 μm, equatorial axis 20-23-26 μm; flowering in Apr-May. (*Z. Tashiro s.n.*; Loc. K)

Eriocaulaceae (1 genus, 2 species)

Syncolpate monad; exine 1.0-1.5 μm thick; sexine echinate, echini <1.0 μm high; colpi in 3-4 parallel spirals around the grain; grains circular; grains 20-26 μm; flowering in Aug-Oct.
ref. *Eriocaulon cinereum* R. Br., 'Hoshikusa' (Aug-Oct): 1; *E. miquelianum* Koernicke, 'Inunohige' (Aug-Oct): 3.

Euphorbiaceae (6 genera, 8 species)

Acalypha (1 species)

Acalypha australis L. 'Enokigusa'
Tricolporate, stephanocolporate (4 colporate) monad; exine 1.2 μm thick; sexine scabrate; colpi short, equatorial prominent; pori circular 1.2 μm wide; oval in equatorial view, circular in polar view; grains 16-20 μm, spherical-oblate; flowering in Aug-Oct. (ref. 4)

Euphorbia, Mercurialis and *Sapium* (4 species)
Tricolporate monad; exine 1.8-2.5 μm thick; sexine baculate, bacula forming tectum on top, tectum sometimes reticulate; colpi long, acute at ends; pori lalongate, with costae; oval in equatorial view, circular in polar view; polar axis 21-45 μm, equatorial axis 18-40 μm, prolate-spherical; flowering in Apr-Jul.
ref. *Euphorbia sieboldiana* Morr. et Decne., 'Natsutoudai' (Apr-Jun): 4; *E. supina*

Rafin., 'Konishikisou' (Jun-Jul): 4; *Mercurialis leiocarpa* Sieb. et Zucc., 'Yamaai' (Apr-Jul): 4.

1a. Polar axis >29 μm
.....*Euphorbia sieboldiana, Mercurialis leiocarpa, Sapium japonicum*
1b. Polar axis <29 μm .....*E. supina*

Sapium japonicum (Sieb. et Zucc.) Pax et K. Hoffm. 'Shiraki'
Exine 2.1 μm thick; bacula coarse, tectum reticulate, lumina 0.5 μm wide; apocolpium 4.0-7.0 μm wide, margo thinned; pori lalongate 4.0-5.0 x 7.0-9.0 μm, costae 2.0-2.5 μm thick; polar axis 30-35-40 μm, equatorial axis 26-29-33 μm, P/E ratio 1.00-1.18-1.43; flowering in May-Jul. (*Y. Tateishi and J. Murata 4178*; Loc. A)

Mallotus (1 species)

Mallotus japonicus Muell. Arg. 'Akamegashiwa'
Tricolporate monad; exine 2.4-2.7 μm thick; sexine verrucate, verrucae 0.5-1.0 μm wide; colpi acute at ends, narrow, apocolpium 9.0-10 μm wide, margo thickened; pori zonorate 2.5-3.0 μm wide, costae 3.0 μm thick; oval in equatorial view, circular in polar view; polar axis 21-24-29 μm, equatorial axis 21-24-30 μm, P/E ratio 0.90-0.98-1.06 (n=18); flowering in Jul. (*M. Hiroe 7182*; Loc. A)

Phyllanthus (2 species)
Stephanocolporate (4-6 colporate) monad; exine 1.5 μm thick; sexine striate, reticulate; colpi long; pori circular 1.5-3.5 μm wide, with costae; oval in equatorial view, circular in polar view; grains 16-26 μm, spherical; flowering in May-Aug.
ref. *Phyllanthus flexuosus* (Sieb. et Zucc.) Muell. Arg., 'Kobannoki' (May): 4; *P. matsumurae* Hayata, 'Himemikansou' (Jun-Aug): 3.

1a. Sexine reticulate .....*Phyllanthus flexuosus*
1b. Sexine striate .....*P. matsumurae*

Eupteleaceae (1 genus, 1 species)

Euptelea polyandra Sieb. et Zucc. 'Fusazakura'
Pericolpate (6 colpate) monad; exine 1.5 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide; colpi rounded at ends, 12-18 μm long, 5.0-7.0 μm wide, verrucate, scabrate; grains circular; grains 21-24-27 μm; flowering in Mar-May. (*G. Murata 22446*; Loc. K)

Fagaceae (3 genera, 7 species)

Tricolporate monad; exine 1.0-2.0 μm thick; sexine psilate, verrucate; colpi acute at ends, margo thickened; pori circular, lalongate; oval in equatorial view, circular in polar view; polar axis 12-41 μm, equatorial axis 8-45 μm, spherical-prolate; flowering in Apr-Jul.
ref. *Fagus japonica* Maxim., 'Inubuna' (Apr-May): 4; *Quercus crispula* Blume,

'Mizunara' (May): 4; *Q. salicina* Blume, 'Urajirogashi' (May): 4; *Q. serrata* Thunb. ex Murray, 'Konara' (May): 4; *Q. sessilifolia* Blume, 'Tsukubanegashi' (May): 4.

1a. Grains small, <15 μm, pori lalongate, sexine psilate ..... *Castanea crenata*
1b. Grains large, >18 μm, pori circular, sexine verrucate
2a. Polar axis <27 μm, pori indistinct ..... *Quercus* (*4 spp.*)
2b. Polar axis >27 μm, pori >7.0 μm wide
3a. Apocolpium >17 μm wide ..... *Fagus crenata*
3b. Apocolpium <8.0 μm wide ..... *F. japonica*

Castanea crenata Sieb. et Zucc. 'Kuri'
Exine 1.0 μm thick; sexine psilate; apocolpium 1.5-2.0 μm wide; pori lalongate 1.5-2.0 × 2.5-3.5 μm, costae 1.0 μm thick; polar axis 11-14-15 μm, equatorial axis 7-10-12 μm, P/E ratio 1.22-1.38-1.72; flowering in Jun-Jul. (*S. Fujii* 143; Loc. K)

Fagus crenata Blume 'Bunanoki'
Exine 2.0 μm thick; sexine verrucate; colpi ragged, apocolpium 17-23 μm wide; pori circular 6.0-8.0 μm wide, costae 1.5-2.0 μm thick; polar axis 28-34-39 μm, equatorial axis 32-36-42 μm, P/E ratio 0.85-0.94-1.04; flowering in Apr-May. (*H. Nagamasu 4499*; Loc. A)

Flacourtiaceae (1 genus, 1 species)

Idesia polycarpa Maxim. 'Iigiri'
Tricolporate monad; exine 1.2 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide; colpi acute at ends, constricted at equator, apocolpium 5.0-6.0 μm wide; pori lalongate 1.0-2.0 × 5.0-6.0 μm, costae 1.0-1.5 μm thick; oval in equatorial view, circular in polar view; polar axis 16-19-20 μm, equatorial axis 13-16-18 μm, P/E ratio 1.00-1.20-1.37; flowering in Apr-May. (*G. Murata 668*; Loc. K)

Gentianaceae (3 genera, 7 species)

Tricolporate monad; exine 2.0-3.0 μm thick; sexine striate, reticulate; colpi long, acute at ends, margo thinned; pori lalongate, equatorial apiculate, with costae; oval in equatorial view, circular, semiangular in polar view; polar axis 23-45 μm, equatorial axis 18-35 μm, prolate; flowering in Mar-May, Aug-Nov.
ref. *Gentiana thunbergii* (G. Don) Griseb., 'Harurindou' (Apr-May): 4; *G. triflora* Pallas, 'Ezorindou' (Sep-Oct): 4; *G. zollingeri* Fawcett, 'Fuderindou' (Apr-May): 4; *Swertia bimaculata* (Sieb. et Zucc.) Hook. et Thoms., 'Akebonosou' (Sep-Oct): 4; *S. japonica* (Schult.) Makino, 'Senburi' (Aug-Nov): 4.

1a. Polar axis >36 μm ..... *Gentiana thunbergii*
1b. Polar axis 32-36 μm, sexine striate ..... *Gentiana scabra, G. triflora*
1c. Polar axis <32 μm, sexine striate, reticulate
..... *G. zollingeri, Swertia bimaculata, Tripterospermum japonicum*

Gentiana scabra Bunge var. *buergeri* (Miq.) Maxim. 'Rindou'
Exine 2.2 μm thick; sexine striate, striae 0.5-1.0 μm wide; apocolpium 8.0-9.0 μm

wide; pori 4.0-5.0 × 6.0-7.0 μm, costae 1.0-1.5 μm thick; circular in polar view; polar axis 27-30-33 μm, equatorial view 21-26-29 μm, P/E ratio 1.04-1.16-1.48; flowering in Sep-Nov. (*H. Koyama 928*; Loc. A)

Tripterospermum japonicum (Sieb. et Zucc.) Maxim. 'Tsururindou'
Exine 2.0 μm thick; sexine striate, reticulate; apocolpium 8.0-9.0 μm wide; pori 4.0-5.0 × 8.0 μm, costae 1.0 μm thick; circular in polar view; polar axis 32-34-38 μm, equatorial view 27-29-30 μm, P/E ratio 1.08-1.18-1.27; flowering in Aug-Oct. (*T. Takabayashi 582*; Loc. K)

Geraniaceae (1 genus, 2 species)

Tricolpate monad; exine 5.0-7.0 μm thick; sexine clavate, clavae forming reticulum on top; colpi rounded at ends; oval in equatorial view, circular in polar view; grains 53-78 μm, oblate-spherical; flowering in Jul-Oct.
ref. *Geranium wilfordii* Maxim., 'Mitsubafuuro' (Jul-Oct): 3.

Geranium nepalense Sweet 'Gennoshouko'
Exine 5.0-6.0 μm thick; colpi 12-21 μm long, 11 μm wide; polar axis 53-58-62 μm, equatorial axis 58-62-65, P/E ratio 0.91-0.94-0.98 (n=8); flowering in Jul-Oct. (*C. Hashimoto s.n.*; Loc. K)

Gesneriaceae (1 genus, 1 species)

Conandron ramondioides Sieb. et Zucc. 'Iwatabako'
Tricolporate monad; exine 0.5-1.0 μm thick; sexine scabrate; colpi acute at ends, apocolpium 4.0 μm wide, margo thickened; pori lolongate 3.0 × 2.0 μm; oval in equatorial view, circular, semiangular in polar view; polar axis 6-7-8 μm, equatorial axis 6-7 μm, P/E ratio 1.00-1.17-1.20; flowering in Jun-Aug. (*S. Hosomi s.n.*; Loc. K)

Gramineae

Monoporate monad; sexine verrucate; pori circular <5.0 μm wide, distinct annulus present; grains circular; flowering in May-Nov.
ref. 1, 3, 4.

Guttiferae (1 genus, 3 species)

Tricolporate monad; exine 1.5-2.0 μm thick; sexine reticulate, rugulate; colpi acute at ends, long, equatorial prominent, margo thinned; pori circular, lalongate, with costae; oval in equatorial view, circular in polar view; polar axis 14-24 μm, equatorial axis 12-18 μm, prolate; flowering in Jul-Aug.
ref. *Hypericum ascyron* L., 'Tomoesou' (Jul-Aug): 4; *H. oliganthum* Fr. et Sav., 'Azeotogiri' (Jul-Aug): 3.

Hypericum erectum Thunb. 'Otogirisou'
Sexine reticulate, lumina 0.5 μm wide; apocolpium 4.0 μm wide; pori lalongate 2.0 × 4.0 μm wide, costae 1.0 μm thick; polar axis 13-15-17 μm, equatorial axis 11-12-14 μm, P/E ratio 1.09-1.24-1.44; flowering in Jul-Aug. (*Y. Araki 532*; Loc. A)

Haloragaceae (1 genus, 1 species)

Haloragis micrantha (Thunb.) R. Br. 'Arinotougusa'
Tricolpate, stephanocalpate (4-5 colpate) monad; exine 2.0-2.5 μm thick; sexine verrucate, rugulate; colpi acute at ends, 3.5-4.0 μm long, 1.0 μm wide, margo 3.0 μm thick; oval in equatorial view, circular, semiangular in polar view; polar axis 17-20-23 μm, equatorial axis 20-23-28 μm, P/E ratio 0.76-0.86-1.00; flowering in Jul-Sep. (*M. Tagawa 1758*; Loc. A)

Hamamelidaceae (1 genus, 1 species)

Hamamelis japonica Sieb. et Zucc. 'Marubamansaku'
Tricolpate monad; exine 1.2-1.5 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide; colpi acute at ends, apocolpium 4.0-6.0 μm wide, margo thinned; oval in equatorial view, circular in polar view; polar axis 13-15-17 μm, equatorial axis 13-17-19 μm, P/E ratio 0.78-0.90-1.10; flowering in Mar-Apr. (*M. Tagawa 2004*; Loc. K)

Hippocastanaceae (1 genus, 1 species)

Aesculus turbinata Blume 'Tochinoki'
Tricolporate monad; exine 1.0 μm thick; sexine striate, reticulate, lumina <0.5 μm wide; colpi acute at ends, echinate, apocolpium 3.0-4.0 μm wide; pori lolongate 6.0-7.0 × 3.0-4.0 μm; compressed oval in equatorial view, circular in polar view; polar axis 22-25-28 μm, equatorial axis 12-15-17 μm, P/E ratio 1.58-1.68-1.83; flowering in May-Jun. (*H. Takahashi 928*; Loc. A)

Icacinaceae (1 genus, 1 species)

Hosiea japonica (Makino) Makino 'Kurotakikazura'
Tricolporate monad; exine 0.5-1.0 μm thick; sexine verrucate, scabrate; colpi acute at ends, equatorial prominent, apocolpium 17 μm wide; pori lalongate 4.0 × 8.0 μm, costae 0.5 μm thick; oval in equatorial view, circular in polar view; polar axis 22-27-33 μm, equatorial axis 22-25-29 μm, P/E ratio 0.86-1.08-1.22; flowering in May. (*S. Kitamura s.n.*; Loc. K)

Iridaceae (1 genus, 3 species)

Monocolpate monad; exine 1.5-3.0 μm thick; sexine reticulate, lumina 1.0-4.0 μm wide, muri simplicolumellate; grains elliptic; polar axis 40-63 μm, equatorial axis 55-90 μm; flowering in Apr-Jul.

ref. *Iris gracilipes* A. Gray, 'Himeshaga' (May-Jun): 1; *I. sanguinea* Hornem., 'Ayame' (May-Jul): 4.

Iris japonica Thunb. 'Shaga'
Exine 3.0 μm thick; lumina 2.0-4.0 μm wide, muri coarsely simplicolumellate; polar axis 45-53-60 μm, equatorial axis 65-78-90 μm; flowering in Apr-May. (*H. Murakami 58*; Loc. K)

Juglandaceae (2 genera, 2 species)

Juglans (1 species)

Juglans mandshurica Maxim. 'Onigurumi'
Periporate (6-9 porate) monad; exine 1.0-1.5 μm thick; sexine verrucate; 5-7 pori on equator and 1-2 pori in proximal face, pori circular 2.0-3.0 μm wide, annuli formed by ektexine; oval in equatorial view, angular in polar view; polar axis 21-36 μm, equatorial axis 27-42 μm, oblate; flowering in May-Jun. (ref. 4)

Pterocarya (1 species)

Pterocarya rhoifolia Sieb. et Zucc. 'Sawagurumi'
Stephanoporate (5-8 porate) monad; exine 1.0-1.5 μm thick; sexine scabrate; pori circular 2.0-3.0 μm wide, annuli formed by ektexine 2.0 μm thick; oval in equatorial view, angular in polar view; polar axis 17-22-25 μm, equatorial axis 30-33-35 μm, P/E ratio 0.57-0.69-0.75; flowering in Apr-Jun. (*S. Okamoto s.n.*; Loc. A)

Juncaceae (1 genus, 3 species)

Inaperturate tetrads; exine 0.5 μm thick, sometimes torn in distal face; sexine scabrate; tetrads tetrahedal; tetrads 23-45 μm; flowering in Apr-Jul.
ref. *Luzula capitata* (Miq.) Miq., 'Suzumenoyari' (Apr-May): 3; *L. multiflora* Lejeune, 'Yamasuzumenohie' (May-Jul): 1; *L. plumosa* E. Meyer, 'Nukaboshisou' (Apr-May): 4.

Labiatae (13 genera, 20 species)

Ajuga, Chelonopsis, Leucosceptrum and *Scutellaria* (6 species)
Tricolpate monad; exine 1.5-2.1 μm thick; sexine reticulate, rugulate, lumina 1.0-2.5 μm wide; colpi long, acute at ends, margo thinned; oval in equatorial view, circular in polar view; polar axis 16-36 μm, equatorial axis 18-45 μm, spherical-oblate; flowering in Mar-May and Aug-Oct.
ref. *Ajuga decumbens* Thunb., 'Kiransou' (Apr-May): 4; *Leucosceptrum japonicum* (Miq.) Kitam. et Murata, 'Tenninsou' (Sep-Oct): 4; *L. stellipilum* (Miq.) Kitam. et Murata, 'Mikaerisou' (Sep-Oct): 3; *Scutellaria indica* L., 'Kobanotatsunamisou' (May-Jun): 4; *S. pekinensis* Maxim., 'Yamatatsunamisou' (May-Jun): 1.

1a. Polar axis >22 μm ..... *Chelonopsis moschata*

1b. Polar axis <22 μm
2a. Sexine reticulate ..... *Ajuga decumbens, Leucosceptrum japonicum*
2b. Sexine rugulate ..... *Ajuga decumbens, Scutellaria indica*

Chelonopsis moschata Miq. 'Jakousou'
Exine 2.1 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide; colpi ragged, apocolpium 5.0-6.0 μm wide; polar axis 22-24-27 μm, equatorial axis 22-26-28 μm, P/E ratio 0.85-0.93-1.12; flowering in Aug-Sep. (*M. Tagawa 984*; Loc. K)

Teucrium (1 species)

Teucrium viscidum Blume 'Tsurunigakusa'
Tricolpate monad; exine 1.5 μm thick; sexine scabrate; colpi acute at ends, long, margo thinned; oval in equatorial view, circular in polar view; polar axis 30-32 μm, equatorial axis 21-23 μm, prolate; flowering in Jul-Sep. (ref. 3)

Clinopodium, Elsholtzia, Glechoma, Isodon, Lycopus, Meehania, Prunella and *Salvia* (13 species)
Stephanocolpate (6 colpate) monad; exine 1.5-3.0 μm thick; sexine baculate, reticulate, lumina 0.5-4.0 μm wide; colpi acute at ends; oval in equatorial view, circular in polar view; polar axis 19-42 μm, equatorial axis 17-43 μm, spherical; flowerimg in Apr-Oct.
ref. *Clinopodium chinense* (Benth.) O. Kuntze, 'Kurumabana' (Sug-Sep): 4; *C. gracile* (Benth.) O. Kuntze, 'Toubana' (May-Aug): 4; *C. micranthum* (Regel) Hara, 'Inutoubana' (Aug-Oct): 1; *C. sachalinense* (Fr. Schm.) Koidz., 'Miyamatoubana' (Jul-Sep): 1; *Elsholtzia ciliana* (Thunb.) Hylander, 'Naginatakouju' (Sep-Oct): 1; *Glechoma hederacea* L., 'Kakidooshi' (Apr-May): 4; *Isodon inflexa* (Thunb.) Kudo, 'Yamahakka' (Sep-Oct): 1; *Lycopus ramosissimus* Makino, 'Koshirone' (Aug-Oct): 1; *Prunella vulgaris* L., 'Utsubogusa' (Jun-Aug): 4.

1a. Sexine baculate ..... *Clinopodium, Glechoma*
1b. Sexine reticulate
2a. Equatorial axis <30 μm
3a. Polar axis >27 μm, >3.0 μm wide lumina present ..... *Isodon longituba*
3b. Polar axis <27 μm, lumina 1.0-3.0 μm wide ..... *I. trichocarpa*
2b. Equatorial axis >30 μm
4a. >2.0 μm wide lumina present ..... *I. longituba*
4b. Lumina 1.0-2.0 μm wide
5a. Exine >2.5 μm thick ..... *Salvia glabrescens*
5b. Exine <2.5 μm thick ..... *Meehania urticifolia*

Isodon longituba (Miq.) Kudo 'Akichouji'
Exine 2.0 μm thick; sexine reticulate, lumina 1.0-4.0 μm wide, heterobrochate, muri diplicolumellae; apocolpium 7.0-8.0 μm wide, margo thinned; polar axis 26-30-33 μm, equatorial axis 25-32-35 μm, P/E ratio 0.84-0.95-1.20; flowering in Aug-Oct. (*G. Koidzumi s.n.*; Loc. K)

I. trichocarpa (Maxim.) Kudo 'Kurobanahikiokoshi'
Exine 1.5 μm thick; sexine reticulate, lumina 1.0-2.5 μm wide, heterobrochate;

apocolpium 6.0 μm wide, margo thinned; polar axis 23-25-27 μm, equatorial axis 23-25-27 μm, P/E ratio 0.90-0.99-1.11 (n=7); flowering in Aug-Sep. (*G. Koidzumi s.n.*; Loc. K)

Meehania urticifolia (Miq.) Makino 'Rashoumonkazura'
Exine 2.0 μm thick; sexine reticulate, lumina 1.0-2.0 μm wide; apocolpium 4.0-9.0 μm wide, margo thinned; polar axis 32-38-42 μm, equatorial axis 33-38-43 μm, P/E ratio 0.76-1.01-1.15 (n=15); flowering in Apr-May. (*Y. Inamasu 21*; Loc. A)

Salvia glabrescens Makino 'Akigiri'
Exine 2.5-3.0 μm thick; sexine reticulate, lumina 1.0-2.0 μm wide, homobrochate; apocolpium 7.0-15 μm wide; polar axis 27-33-38 μm, equatorial axis 31-36-43 μm, P/E ratio 0.76-0.90-1.04; flowering in Aug-Oct. (*S. Okamoto s.n.*; Loc. A)

Lardizabalaceae (1 genus, 2 species)

Tricolpate monad; exine 1.2-2.0 μm thick; sexine reticulate, lumina 0.5 μm wide; oval in equatorial view, circular in polar view; polar axis 15-19 μm, equatorial axis 15-22 μm, spherical-prolate; flowering in Apr-May.
ref. *Akebia trifoliata* (Thunb.) Koidz., 'Mitsubaakebi' (Apr-May): 4.

Akebia quinata (Thunb.) Decne. 'Akebi'
Exine 1.2 μm thick; colpi acute at ends, ragged, apocolpium 6.0-8.0 μm wide; polar axis 15-5-16-18 μm, equatorial axis 15-18-20 μm, P/E ratio 0.75-0.90-1.17; flowering in Apr-May. (*M. Hiroe 16270*; Loc. K)

Lauraceae

Damaged by acetolysis; inaperturate monad; exine 1.0 μm thick; sexine echinate; grains circular; grains 30-33 μm; flowering in Mar-Apr.
ref. 1, 3.

Leguminosae (14 genera, 16 species)

Albizia (1 species)

Albizia julibrissin Durazz. 'Nemunoki'
Periporate polyads (16 grains); exine 1.5 μm thick; sexine psilate, scabrate; polyads oval, circular, symmetrically arranged; polyads 85-90 μm; flowering in Jul-Aug. (ref. 4)

Dumasia (1 species)

Dumasia truncata Sieb. et Zucc. 'Nosasage'
Periporate (6 porate) monad; exine 1.8 μm thick; sexine rugulate, reticulate; 2 pori meridionally arranged at each apex, pori circular 9.0 μm wide; depressed oval in equatorial view, angular in polar view; polar axis 36-41 μm, equatorial axis 20-22

μm, oblate; flowering in Aug-Sep. (ref. 4)

Apios (1 species)

Apios fortunei Maxim. 'Hodoimo'
Tricolporate monad; exine 2.5 μm thick; sexine scabrate; colpi acute at ends, short, 14-15 μm long, verrucate; pori lolongate 10-12 μm long; oval in equatorial view, semiangular in polar view; polar axis 36-42 μm, equatorial axis 34-42 μm, spherical; flowering in Jul-Sep. (ref. 4)

Amphicarpaea, Astragalus, Cassia, Desmodium, Lespedeza, Lotus, Pueraria, Trifolium and *Wisteria* (13 species)
Tricolporate monad; exine 1.0-1.8 μm thick; sexine reticulate, verrucate, rugulate, scabrate; colpi long, sometimes prominent at equator; pori circular, lolongate 5.0-10 μm long, with costae; oval, compressed oval in equatorial view, circular, semiangular, angular in polar view; polar axis 11-32 μm, equatorial axis 9-33 μm, prolate-spherical; flowering in Apr-Oct.
ref. *Amphicarpaea bracteata* (L.) Fernald, 'Yabumame' (Aug-Oct): 4; *Astragalus sinicus* L., 'Gengo' (Apr-Jun): 4; *Cassia mimosoides* L., 'Kawaraketsumei' (Aug-Oct): 1; *Desmodium oldhamii* Oliver, 'Fujikanzou' (Aug-Sep): 1; *Lespedeza cyrtobotrya* Miq., 'Marubahagi' (Aug-Oct): 3; *L. juncea*: (L. fil.) Pers., 'Medohagi' (Aug-Oct): 3; *L. striata* (Thunb.) Hook. et Arn., 'Yahazusou' (Aug-Sep): 1; *Lotus corniculatus* L., 'Miyakogusa' (Apr-Oct): 4.

1a. Polar axis <16 μm ..... *Lotus corniculatus*
1b. Polar axis 16-21 μm
2a. Equatorial axis <12 μm ..... *Astragalus sinicus*
2b. Equatorial axis >12 μm ..... *Lespedeza bicolor*
1c. Polar axis >21 μm
3a. Angular in polar view ..... *Amphicarpaea bracteata*
3b. Circular, semiangular in polar view
4a. Apocolpium <7.0 μm wide ..... *Trifolium repens*
4b. Apocolpium >7.0 μm wide
5a. Oval in equatorial view, sexine verrucate, pori circular <7.0 μm wide, costae >1.5 μm thick ..... *Desmodium podocarpum*
5b. Compressed oval in equatorial view, sexine reticulate, pori lolongate >7.0 μm long, costae <1.5 μm thick ..... *Pueraria lobata, Wisteria floribunda*

Desmodium podocarpum DC. 'Nusubitohagi'
Exine 1.5 μm thick; sexine verrucate, rugulate; colpi constricted and prominent at equator, ragged, apocolpium 10 μm wide; pori circular 6.0-7.5 μm wide, costae 2.0 μm thick; oval in equatorial view, circular in polar view; polar axis 25-27-29 μm, equatorial axis 20-22-25 μm, P/E ratio 1.10-1.25-1.44; flowering in Jul-Sep. (*M. Tagawa 746*; Loc. K)

Lespedeza bicolor Turcz. 'Yamahagi'
Exine 1.2-1.5 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi acute at ends, ragged, apocolpium 5.0-6.0 μm wide; pori lolongate 6.0 × 5.0 μm, costae 1.5 μm thick; oval in equatorial view, circular in polar view; polar axis 15-18-20 μm,

equatorial axis 12-15-17 μm, P/E ratio 1.09-1.22-1.37; flowering in Jul-Sep. (*Z. Tashiro s.n.*; Loc. K)

Pueraria lobata (Willd.) Ohwi 'Kuzu'
Exine 1.5 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide, muri 0.5 μm wide; colpi prominent at equator, apocolpium 12-13 μm wide, margo 1.5-2.0 μm thick; pori lolongate 7.0-8.0 × 6.0-7.0 μm, costae 1.0-1.5 μm thick; compressed oval in equatorial view, circular in polar view; polar axis 23-28-30 μm, equatorial axis 20-22-28 μm, P/E ratio 1.00-1.24-1.38; flowering in Aug-Oct. (*S. Tsugaru 15184*; Loc. K)

Trifolium repens L. 'Shirotsumekusa'
Exine 1.5 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide, muri 0.5-1.0 μm wide; colpi ragged, prominent at equator, apocolpium 5.0 μm wide; pori circular 5.0-6.0 μm wide, costae 1.5 μm thick; oval, compressed oval in equatorial view, circular in polar view; polar axis 23-27-32 μm, equatorial axis 18-20-22 μm, P/E ratio 1.17-1.35-1.60; flowering in May-Oct. (*S. Hosomi 6711*; Loc. K)

Wisteria floribunda (Willd.) DC. 'Fuji'
Exine 1.9 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi ragged, prominent at equator, apocolpium 14-16 μm wide, margo thickened; pori lolongate 7.0-9.0 × 4.0-6.0 μm, costae 1.0 μm thick; compressed oval in equatorial view, circular, semiangular in polar view; polar axis 21-27-32 μm, equatorial axis 20-24-33 μm, P/E ratio 0.88-1.15-1.34; flowering in May. (*G. Murata et al. 33*; Loc. A)

Lentibulariaceae

Stephanocolporate monad; sexine psilate, scabrate; colpi acute at ends, prominent at equator; pori zonorate, lalongate; equatorial acute oval in equatorial view, circular in polar view; oblate-spherical; flowering in Jun-Oct.
ref. 1, 4.

Liliaceae (16 genera, 22 species)

Smilax and *Trillium* (4 species)
Inaperturate monad; exine 0.8-1.0 μm thick; sexine verrucate, scabrate; grains circular; grains 12-33 μm; flowering in Apr-Aug.
ref. *Similax china* L., 'Sarutoriibara' (Apr-May): 4; *S. nipponica* Miq., 'Tachishiode' (May-Jun): 1; *Trillium smallii* Maxim., 'Enreisou' (Apr-May): 3.

1a. Grains >30 μm, sexine scabrate ..... *Trillium smallii*
1b. Grains <25 μm, sexine verrucate ..... *Smilax china, S. riparia*

Smilax riparia A.DC. 'Shiode'
Exine 0.8 μm thick; sexine verrucate, verrucae 0.5-1.0 μm wide; grains 12-16-20 μm; flowering in Jul-Aug. (*K. Nagai 25503*; Loc. K)

Chionographis (1 species)

Chionographis japonica Maxim. 'Shiraitosou'
Stephanoporate (4 porate) monad; exine 1.5 μm thick; sexine verrucate; pori circular 2.0-2.5 μm wide, annuli absent; grains circular; grains 12-18 μm; flowering in May-Jun. (ref. 4)

Cardicocrinum, Disporum, Heloniopsis, Hemerocallis, Hosta, Lilium, Metanarthecium, Paris, Polygonatum, Scilla, Smilacina, Tricyrtis and *Veratrum* (17 species) Monocolpate monad; exine 1.0-3.0 μm thick; sexine reticulate, verrucate, gemmate, lumina 0.5-7.0 μm wide, smaller in margo; colpi usually ragged; grains elliptic; polar axis 12-65 μm, equatorial axis 18-103 μm; flowering in Apr-Oct.
ref. *Cardicocrinum cordatum* (Thunb.) Makino, 'Ubayuri' (Jul-Aug): 4; *Disporum smilacinum* A. Gray, 'Chigoyuri' (Apr-May): 4; *Heloniopsis orientalis* (Thunb.) C. Tanaka, 'Shoujoubakama' (Apr-May): 4; *Hemerocallis dumortieri* Morr., 'Nikkoukisuge' (Jul-Aug): 3; *H. fulva* L., 'Yabukanzou' (Jul-Oct): 4; *Lilium lancifolium* Thunb., 'Oniyuri' (Jul-Aug): 4; *Metanarthecium luteo-viride* Maxim., 'Nogiran' (Jun-Aug): 1; *Paris tetraphylla* A. Gray, 'Tsukubanesou' (May-Aug): 3; *Polygonatum falcatum* A. Gray, 'Narukoyuri' (May-Jun): 3; *P. lasianthum* Maxim., 'Miyamanarukoyuri' (May-Jun): 1; *Scilla scilloides* (Lindl.) Druce, 'Tsurubo' (Aug-Sep): 4; *Smilacina japonica* A. Gray, 'Yukizasa' (May-Jul): 4.

1a. Sexine gemmate ..... *Paris tetraphylla*
1b. Sexine verrucate
2a. Equatorial axis >60 μm ..... *Hosta sieboldiana*
2b. Equatorial axis <60 μm
3a. Exine 1.5-2.0 μm thick
..... *Disporum smilacinum, D. sessile, Smilacina japonica*
3b. Exine 1.0 μm thick ..... *Heloniopsis orientalis*
1c. Sexine reticulate
4a. Equatorial axis <25 μm ..... *Metanarthecium luteo-viride*
4b. Equatorial axis >25 μm
5a. Lumina large, >4.0 μm wide lumina present, muri irregular in shape, duplicolumellate ..... *Hemerocallis fulva, Lilium lancifolium*
5b. Lumina medium size, 1.5-4.0 μm wide lumina present
6a. Equatorial axis >60 μm ..... *Cardicocrinum cordatum*
6b. Equatorial axis <40 μm ..... *Veratrum album*
5c. Lumina small, <1.5 μm wide
7a. Ragged colpi with 3.0-6.0 μm long crack ..... *Tricyrtis affinis*
7b. Ragged colpi without crack
..... *Polygonatum falcatum, P. macranthum, Scilla scilloides*

Disporum sessile Don 'Houchakusou'
Exine 1.8 μm thick; sexine verrucate, verrucae 0.5 μm wide; polar axis 27-32-35 μm, equatorial axis 37-43-48 μm; flowering in Apr-May. (*S. Kitamura s.n.*; Loc. K)

Hosta sieboldiana (Lodd.) Engler 'Oobagiboushi'
Exine 1.7 μm thick; sexine verrucate, verrucae 1.0-1.5 μm wide; polar axis 38-51-64 μm, equatorial axis 66-80-94 μm; flowering in Jun-Aug. (*S. Okamoto s.n.*; Loc. A)

Polygonatum macranthum (Makino) Koidz. 'Oonarukoyuri'
Exine 1.0 μm thick; sexine reticulate, lumina 0.5 μm wide; polar axis 27-36-40 μm,

equatorial axis 42-47-53 μm; flowering in May-Jun. (*G. Murata s.n.*; Loc. S)

Tricyrtis affinis Makino 'Yamajinohototogisu'
Exine 1.5 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi ragged with cracks 3.0-6.0 μm long; polar axis 22-30-35 μm, equatorial axis 41-45-48 μm; flowering in Aug-Oct. (*H. Takahashi 2074*; Gifu Pref.)

Veratrum album L. 'Baikeisou'
Exine 1.7 μm thick; sexine reticulate, lumina 1.0-2.0 μm wide, muri simpli-duplicolumellate; polar axis 22-26-29 μm, equatorial axis 30-33-36 μm; flowering in Jul-Aug. (*S. Okamoto s.n.*; Loc. A)

Loranthaceae (1 genus, 1 species)

Viscum album L. 'Yadorigi'
Tricolporate monad; exine 2.0-2.3 μm thick; sexine baculate, bacula 2.0-4.0 μm high, 1.2 μm wide; colpi wide, rounded at ends, apocolpium 15-20 μm wide; pori lalongate 2.0-4.0 × 10-13 μm, indistinct, costae 3.0 μm thick; oval in equatorial view, circular in polar view; 31-36-40 μm, 28-33-40 μm, P/E ratio 0.93-1.08-1.21; flowering in Feb-Apr. (*H. Nagamasu 4498*; Loc. A)

Lythraceae (2 genera, 2 species)

Lythrum (1 species)

Lythrum anceps (Koehne) Makino 'Misohagi'
Heterocolpate (with 3 colpori and 3 furrows) monad; exine 1.5 μm thick; sexine striate; colpi rounded at ends, verrucate; pori circular 3.0-5.0 μm wide; oval in equatorial view, circular in polar view; grain size dimorphic, smaller grains: polar axis 18 μm, equatorial axis 18-22 μm, larger grains: polar axis 25-31 μm, equatorial axis 23-31 μm, spherical; flowering in Jul-Aug. (ref. 4)

Rotala (1 species)

Rotala indica (Willd.) Koehne 'Kikashigusa'
Syncolpate, tricolporate monad; exine 1.8 μm thick; sexine scabrate, psilate; if 4 colpi present, colpi joining; pori circular 3.0 μm wide, with costae; oval in equatorial view, circular in polar view; polar axis 23-26 μm, equatorial axis 18-22 μm, prolate; flowering in Aug-Oct. (ref. 4)

Magnoliaceae (1 genus, 2 species)

Monocolpate monad; exine 1.0 μm thick; sexine rugulate, scabrate; colpi narrow-prominent or wide flat; grains elliptic; polar axis 20-43 μm, equatorial axis 23-74 μm; flowering in Apr-Jun.

1a. Grains larger, equatorial axis >60 μm, colpi narrow-prominent, sexine scabrate

.....*Magnolia obovata*
1b. Grains smaller, equatorial axis <40 μm, colpi wide-flat, sexine rugulate .
.....*M. salicifolia*

Magnolia obovata Thunb. 'Hoonoki'
Sexine scabrate; colpi narrow-prominent; polar axis 32-39-43 μm, equatorial axis 62-68-74 μm; flowering in May-Jun. (*G. Murata 9738*; Loc. K)

M. salicifolia Maxim. 'Tamushiba'
Sexine rugulate, vallae 0.5-1.0 μm wide; colpi wide-flat; polar axis 20-26-29 μm, equatorial axis 23-30-35 μm; flowering in Apr-May. (Z. *Tashiro s.n.*; Loc. A)

Menispermaceae (2 genera, 2 species)

Tricolpate monad; exine 1.0-1.5 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi long, acute at ends; oval in equatorial view, circular in polar view; polar axis 14-18 μm, equatorial axis 11-20 μm, prolate-spherical; flowering in May-Aug.
ref. *Cocculus trilobus* (Thunb.) DC., 'Aotsudurafuji' (Jul-Aug): 4.

Sinomenium acutum (Thunb.) Rehd. et Wils. 'Tsudurafuji'
Exine 1.0 μm thick; colpi 0.5 μm wide, apocolpium 5.0 μm wide; polar axis 15-17-18, equatorial axis 11-13-14 μm, P/E ratio 1.18-1.32-1.44; flowering in Jul. (*G. Murata 67770*; Loc. K)

Moraceae (4 genera, 4 species)

Diporate, triporate, periporate (4 porate) monad; exine 1.0 μm thick; sexine scabrate; pori circular 2.0-3.0 μm, annuli slightly thickened; grains circular; grains 11-29 μm; flowering in Apr-Jun and Sep-Oct.
ref. *Broussonetia kazinoki* Sieb., 'Himekouzo' (Apr-Jun): 4; *Fatoua villosa* (Thunb.) Nakai, 'Kuwakusa' (Sep-Oct): 1; *Humulus japonicus* Sieb. et Zucc., 'Kanamugura' (Sep-Oct): 4.

Morus australis Poir. 'Yamaguwa'
Grains 13-17-20 μm; flowering in Apr-May. (*S. Watanabe s.n.*; Loc. F)

Myrsinaceae (1 genus, 1 species)

Ardisia japonica (Thunb.) Blume 'Yabukouji'
Tricolporate monad; exine 1.5 μm thick; sexine reticulate lumina 0.5 μm wide; colpi acute at ends, apocolpium 4.0 μm wide; pori lalongate 1.0 × 5.0 μm, costae 0.5 μm thick; oval in equatorial view, circular in polar view; polar axis 11-13-14 μm, equatorial axis 8-10-13 μm, P/E ratio 1.00-1.22-1.38; flowering in Jul-Aug. (*G. Koidzumi s.n.*; Loc. A)

Nymphaeaceae (1 genus, 1 species)

Nymphaea tetragona Georgi 'Hitsujigusa'

Monoporate (syncolpate) monad; exine 2.0 μm thick; sexine verrucate, verrucae 1.0 μm wide; pori 20-35 μm wide with operculum, or colpi like a ring around the distal pole; oval in equatorial view, circular in polar view; polar axis 20-25-30 μm, equatorial axis 22-30-34 μm, P/E ratio 0.64-0.85-1.22; flowering in Jun-Sep. (*S. Hosomi s.n.*; Loc. K)

Oleaceae (2 genera, 4 species)

Tricolporate monad; exine 1.5-3.5 μm thick; sexine reticulate, bacula or clavae forming reticulum on top, lumina 0.5-3.0 μm wide, muri simplicolumellate; copi acute at ends, apocolpium 6.0-13 μm wide; pori lalongate 1.0-3.0 × 2.0-5.0 μm, costae 1.0 μm thick; oval in equatorial view, circular in polar view; polar axis 21-30 μm, equatorial axis 17-30 μm, spherical-prolate; flowering in Apr-Jul.
ref. *Ligustrum tschonoskii* Decne., 'Miyamaibota' (Jun-Jul): 3.

1a. Polar axis >26 μm, lumina 1.5-3.0 μm wide, apocolpium >10 μm wide, exine >3.0 μm thick ..... *Ligustrum obtusifolium*
1b. Polar axis <26 μm, lumina 0.5-1.5 μm wide, apocolpium <10 μm wide, exine <3.0 μm thick ..... *Fraxinus lanuginosa, F. sieboldiana*

Fraxinus lanuginosa Koidz. 'Aodamo'
Exine 1.5-2.0 μm thick; lumina 0.5-1.0 μm wide; apocolpium 6.0-9.0 μm wide; pori lalongate 1.5-3.0 x 4.0-5.0 μm, indistinct, costae 1.0 μm thick; polar axis 21-24-27 μm, equatorial axis 21-24-28 μm, P/E ratio 0.81-0.99-1.24; flowering in May-Jun. (*M. Hotta 5682*; Loc. F)

F. sieboldiana Blume 'Marubaaodamo'
Exine 1.9 μm thick; lumina 1.0-1.5 μm wide; apocolpium 6.0-7.0 μm wide; pori lalongate 3.0 × 5.0 μm, costae 1.0 μm thick; polar axis 21-22-24 μm, equatorial axis 17-20-22 μm, P/E ratio 1.00-1.11-1.29; flowering in Apr-May. (*Y. Inamasu 26*; Loc. K)

Ligustrum obtusifolium Sieb. et Zucc. 'Ibotanoki'
Exine 3.5 μm thick; lumina 1.5-3.0 μm wide; apocolpium 12-13 μm wide; pori lalongate 1.0 × 2.0 μm, ragged; polar axis 26-28-30 μm, equatorial axis 25-28-30 μm, P/E ratio 0.91-1.00-1.10; flowering in May-Jun. (*D. N. s.n.*, Loc. A)

Onagraceae (3 genera, 4 species)

Triporate monad; exine 1.5-5.5 μm thick; sexine reticulate, rugulate; pori lalongate 5.0-12 μm wide, with vestibulum 5.0-12 μm high; equatorial acute oval in equatorial view, angular, semiangular in polar view; equatorial axis 43-76 μm, oblate; flowering in Jul-Oct.
ref. *Circaea mollis* Sieb. et Zucc., 'Mizutamasou' (Aug-Sep): 4; *Epilobium pyrricholophum* Franch. et Savat., 'Akabana' (Jul-Sep): 4; *Ludwigia epilobioides* Maxim., 'Choujitade' (Aug-Oct): 4.

1a. Equatorial axis <50 μm, vestibulum >10 μm high
.....*Circaea erubescens, Circaea mollis*
1b. Equatorial axis >50 μm, vestibulum <10 μm high
2a. Proximal pole thickened forming 3 ridges .....*Ludwigia epilobioides*
2b. Proximal pole not thickened .....*Epilobium pyrricholophum*

Circaea erubescens Fr. et Sav. 'Tanitade'
Exine 1.5-2.0 μm thick; sexine reticulate, rugulate, lumina 0.5 μm wide; pori lalongate 5.0 × 8.0 μm, with vestibulum 12-16 μm wide, 9.0-12 μm high; polar axis 27-30-33 μm, equatorial axis 40-43-48 μm, P/E ratio 0.65-0.70-0.76 with vestibulum (n=13); flowering in Jul-Oct. (*S. Okamoto s.n.*; Loc. A)

Orchidaceae

Pollinia; 1, 2, 4, 8 pollinia per pollinarium, 1 pollinium attached to glandula, 2 pollinia attached by 1 caudicle to glandula , 4 pollinia directly attached to glandula, 4 pollinia attached by caudicles, or 8 pollinia attached by caudicles; grains forming tetrads or monads; flowering in Apr-Oct.
ref. 1, 3.

Orobanchaceae (1 genus, 1 species)

Aeginetia indica L. 'Nanbangiseru'
Tricolpate monad; exine 1.0 μm thick; sexine scabrate; colpi long, ragged; oval in equatorial view, circular in polar view; polar axis 19-27 μm, equatorial axis 18-24 μm, spherical-prolate; flowering in Jul-Sep. (ref. 4)

Oxalidaceae (1 genus, 2 species)

Tricolpate monad; exine 1.8-2.0 μm thick; sexine reticulate, baculate; colpi ragged, verrucate; oval in equatorial view, circular in polar view; polar axis 25-38 μm, equatorial axis 28-40 μm, spherical-oblate; flowering in Mar-Sep.
ref. *Oxalis corniculata* L., 'Katabami' (May-Sep): 4.

Oxalis griffithii Edgew. et Hook. fil. 'Miyamakatabami'
Exine 2.0 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide, muri simplicolmellae; apocolpium variable; polar axis 25-30-34 μm, equatorial axis 30-35-40 μm, P/E ratio 0.73-0.87-1.00; flowering in Apr-May. (*M. Tagawa 967*; Loc. K)

Paeoniaceae (1 genus, 1 species)

Paeonia japonica (Makino) Miyabe et Takeda 'Yamashakuyaku'
Tricolpate, tricolporate monad; exine 2.0 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi acute at ends, apocolpium 6.0 μm wide; if pori present, pori torn, irregular in shape, 5.0-10 μm wide, costae 1.0 μm thick; oval in equatorial view, circular in polar view; polar axis 23-25-27 μm, equatorial axis 26-28-30 μm, P/E ratio 0.83-0.90-1.00 (n=6); flowering in May. (*K. Nagai 24797*; Loc. K)

Papaveraceae (2 genera, 2 species)

Corydalis (3 species)
Pericolpate (6 colpate) monad; exine 1.0-1.5 μm thick; sexine verrucate, rugulate, verrucae 0.5-1.0 μm wide; colpi rounded at ends, scabrate, margo slightly thickened; grains circular; grains 23-35 μm; flowering in Apr-Jul.

Corydalis incisa (Thunb.) Pers. 'Murasakikeman'
Exine 1.5 μm thick; grains 25-27-29 μm; flowering in Apr-Jun. (*Y. Inamasu 2*; Loc. A)

C. lineariloba Sieb. et Zucc. 'Himeengosaku'
Exine 1.0 μm thick; grains 27-32-35 μm; flowering in Apr-May. (*Ueda et al. 523*; Loc. A)

C. pallida (Thunb.) Pers. 'Miyamakikeman'
Exine 1.0-1.5 μm thick; grains 23-28-30 μm; flowering in Apr-Jul. (*S. Okamoto s.n.*; Loc. A)

Macleaya (1 species)

Macleaya cordata (Willd.) R. Br. 'Takenigusa'
Periporate (6-8 porate) monad; exine 1.5 μm thick; sexine verrucate; pori circular 3.5 μm wide, with annuli; grains circular; grains 15-22 μm, spherical; flowering in Jul-Aug. (ref. 4)

Phrymaceae (1 genus, 1 species)

Phryma leptostachya L. var. *asiatica* Hara 'Haedokusou'
Tricolporate monad; exine 2.0-2.5 μm thick, sexine baculate; colpi acute at ends, apocolpium 6.0-8.0 μm wide, margo thinned; pori lolongate, circular 2.0-5.0 μm wide; oval in equatorial view, circular in polar view; polar axis16-19-22 μm, equatorial axis 17-20-23 μm, P/E ratio 0.82-0.93-1.06; flowering in Jul-Aug. (*S. Hosomi 7108*; Loc. K)

Phytolaccaceae (1 genus, 1 species)

Phytolacca japonica Makino 'Maruminoyamagobou'
Tricolpate monad; exine 2.0-2.5 μm thick; sexine baculate, bacula 1.5-2.0 μm high, forming partly tectum, tectum scabrate; colpi acute at ends, apocolpium 8.0-12 μm wide; oval in equatorial view, circular in polar view; polar axis 20-23-25 μm, equatorial axis 21-25-28 μm, P/E ratio 0.80-0.92-1.18; flowering in Jun-Sep. (*G. Murata* 19426; Loc. K)

Pinaceae (3 genera, 5 species)

Abies and *Pinus* (4 species)

Vesiculate monad with 2 distinct, subglobular sacks; exine 2.8-6.0 μm thick; sexine reticulate, rugulate, distal face thinner, scabrate, verrucate, sacks reticulate; grains oval, elliptic; grains exclude sacks, polar axis 21-78 μm, equatorial axis 30-88 μm; flowering in Apr-May.

ref. *Abies firma Sieb.* et Zucc., 'Momi': 4; *Pinus parvifolia* Sieb. et Zucc., 'Himekomatsu': 4; *Pinus thunbergii* Parlatore, 'Kuromatsu': 4.

1a. Proximal face of the exine >5.0 μm thick, equatorial axis, excluding sacks >60 μm ..... *Abies firma*

1b. Proximal face of the exine <5.0 μm thick, equatorial axis, excluding sacks <60 μm

2a. Sacks hemiglobose, verrucate in the inner side of the distal face between sacks ..... *Pinus parviflora*

2b. Sacks subglobose, scabrate in the inner side of the distal face between sacks ..... *P. densiflora, P. thunbergii*

Pinus densiflora Sieb. et Zucc. 'Akamatsu'

Exine 3.0-5.0 μm thick; polar axis 21-26-30 μm, equatorial axis 31-34-38 μm, excluding sacks, sacks 18-22-24 μm; flowering in Apr-May. (*N. Fukuoka s.n.*; Loc. S)

Tsuga (1 species)

Tsuga sieboldii Carr. 'Tsuga'

Vesiculate monad; continuous or interrupted ring-shaped rudimentary sack arround the grain, 6.0-10 μm wide; exine 2.0 μm thick; sexine verrucate, echinate, verrucae 1.5-3.0 μm wide, echini 1.0 μm high, exine thinner and verrucae smaller in distal face; oval in equatorial view, circular in polar view; grains 56-71 μm; flowering in Apr-May. (ref. 4)

Plantaginaceae (1 genus, 1 species)

Plantago asiatica L. 'Oobako'

Periporate (ca. 7 porate) monad; exine 1.5 μm thick; sexine verrucate, verrucae 1.0-4.0 μm wide; pori circular 1.0-3.0 μm wide, ragged; grains circular; grains 20-22-25 μm; flowering in Apr-Sep. (*S. Okamoto s.n.*; Loc. A)

Polygalaceae (1 genus, 2 species)

Stephanocolporate (15-18 colporate) monad; exine 1.5-2.5 μm thick; sexine scabrate; colpi long, acute at ends, equatorial prominent; pori zonorate; equatorial acute oval in equatorial view, circular in polar view; polar axis 30-46 μm, equatorial axis 17-43 μm, prolate; flowering in Apr-Jul.

ref. *Polygala reinii* Fr. et Sav., 'Kakinohagusa' (May-Jun): 1.

Polygala japonica Houtt. 'Himehagi'

Exine 2.5 μm thick; pori 3.0-4.0 μm wide, costae 2.5 μm thick; polar axis 22-24-27 μm,

equatorial axis 17-21-23 μm, P/E ratio 1.00-1.16-1.29; flowering in Apr-Jul. (*K. Nagai s.n.*; Loc. S)

Polygonaceae (6 genera, 19 species)

Antenoron (1 species)

Antenoron filiforme (Thunb.) Roberty et Vartier 'Mizuhiki'
Pericolpate (16 colpate) monad; exine 2.0 μm thick; sexine reticulate, lumina 1.0-2.0 μm wide, muri duplicolumellate; colpi acute at ends, 24 μm long; grains circular; grains 33-37-39 μm (n=7); flowering in Aug-Oct. (*G. Koidzumi s.n.*; Loc. K)

Bistorta, Polygonum and *Reynoutria* (3 species)
Tricolporate monad; exine 2.0-3.0 μm thick; sexine baculate, bacula forming tectum, tectum reticulate; colpi acute at ends, margo thickened; pori lalongate, zonorate, with costae; oval in equatorial view, circular in polar view; polar axis 23-40 μm, equatorial axis 20-37 μm, prolate; flowering in Apr-Oct.
ref. *Polygonum aviculare* L., 'Michiyanagi' (May-Oct): 4.

1a. Pori zonorate .....*Reynoutria japonica*
1b. Pori lalongate
2a. Pori rounded at ends, tectum perforate, columellae branched ...*Bistora vivipara*
2b. Pori acute at ends, tectum not perforate, columellae not branched
.....*Polygonum aviculare*

Bistorta tenuicaulis (Bisset et Moore) Nakai 'Harutoranoo'
Exine 2.5 μm thick at poles, 1.5 μm thick at equator; apocolpium 11-13 μm wide; pori lalongate 6.0 × 8.0 μm, costae 1.5-2.0 μm thick; polar axis 25-31-39 μm, equatorial axis 21-27-34 μm, P/E ratio 1.05-1.16-1.24 (n=16); flowering in Apr-Jun. (*K. Iwatsuki 686*; Loc. A)

Reynoutria japonica Houtt. 'Itadori'
Exine 2.0-2.5 μm thick; tectum reticulate, lumina <0.5 μm wide; apocolpium 4.0 μm wide; pori zonorate, with costae; polar axis 23-26-29 μm, equatorial axis 20-22-24 μm, P/E ratio 1.15-1.21-1.26 (n=12); flowering in Jul-Sep. (*S. Fujii 1296*; Loc. Osaka Pref.)

Persicaria (11 species)
Periporate (20-30 porate), tricolpate monad; exine 4.0-8.0 μm thick; sexine reticulate, lumina 3.0-5.5 μm wide, muri dipli-triplicolumellate, 2.0-4.0 μm wide; pori circular 2.0-5.0 μm wide in the lumina; grains circular; grains 36-73 μm; flowering in May-Nov.
ref. *Persicaria conspicua* (Nakai) Nakai, 'Sakuratade' (Aug-Oct): 4; *P. debilis* (Meisn.) H. Gross, 'Miyamatanisoba' (Jul-Oct): 1; *P. hydropiper* (L.) Spach 'Yanagitade' (Jul-Oct): 4; *P. longiseta* (De Bruyn) Kitag., 'Inutade' (Jun-Oct): 4; *P. makinoi* (Nakai) Nakai, 'Oonebaritade' (Jul-Oct): 1; *P. nepalensis* (Meisn.) H. Gross, 'Tanisoba' (Jul-Oct): 4; *P. nipponensis* (Makino) H. Gross, 'Yanonegusa'

(Sep-Oct): 4.

1a. Tricolpate ..... *Persicaria nepalensis*
1b. Periporate ..... *Persicaria* (10 spp.)

Persicaria aestiva Ohki 'Unagitsukami'
Periporate monad; exine 6.0-7.0 μm thick; lumina 3.0-5.0 μm wide, muri 3.0-4.0 μm wide; pori circular 2.5-3.0 μm wide; grains 42-45-48 μm (n=6); flowering in Sep-Oct. (*G. Murata 11384*; Loc. A)

P. pubescens (Blume) Hara 'Bontokutade'
Periporate monad; exine 6.0-8.0 μm thick; lumina 3.0-5.0 μm wide, muri 2.5-3.5 μm wide; pori circular 3.0-4.0 μm wide; grains 42-47-53 μm (n=17), flowering in Sep-Oct. (*H. Koyama 798*; Loc. K)

P. senticosa (Fr. et Sav.) H. Gross 'Mamakonoshirinugui'
Periporate monad; exine 6.0 μm thick; lumina 2.0-5.0 μm wide, muri 2.5-3.0 μm wide; pori circular 2.0-3.0 μm wide; grains 36-44-48 μm; flowering in Sep-Oct. (*S. Kitamura s.n.*; Loc. K)

P. thunbergii (Sieb. et Zucc.) H. Gross 'Mizosoba'
Periporate monad; exine 5.0-7.0 μm thick; lumina 4.5-5.5 μm wide, muri 3.0-3.5 μm wide; pori circular 4.0-5.0 μm wide; grains 51-59-73 μm; flowering in Jul-Oct. (*T. Takahashi 1268*; Loc. K)

Rumex (4 species)
Tricolporate, pericolporate (6, 12 colporate) monad; exine 1.5-2.0 μm thick; sexine baculate, bacula forming tectum on top, tectum reticulate; colpi acute at ends; pori circular, lalongate, with costae; oval in equatorial view, circular in polar view; grains 15-32 μm, spherical-oblate; flowering in May-Sep.
ref. *Rumex acetosa* L., 'Suiba' (May-Aug): 4; *R. acetosella* L., 'Himesuiba' (May-Aug): 3; *R. japonicus* Houtt., 'Gishigishi' (Jun-Aug): 4; *R. obtusifolius* L., 'Ezonogishigishi' (Jun-Sep): 3.

Pontederiaceae (1 genus, 1 species)

Monochoria vaginalis (Burm. fil.) Presl var. *plantaginea* (Roxb.) Solms-Laub. 'Konagi'
Monocolpate monad; exine 1.5-2.0 μm thick; sexine verrucate, rugulate, verrucae 1.0 μm wide; colpi ragged; grains elliptic; polar axis 19-23-26 μm, equatorial axis 37-41-46 μm; flowering in Sep-Oct. (*S. Okamoto s.n.*; Loc. A)

Portulacaceae (1 genus, 1 species)

Portulaca oleracea L. 'Suberihiyu'
Pericolpate (10-15 colpate) monad; exine 3.5 μm thick; sexine echinate, echini 1.0-1.5 μm high; colpi rounded at ends, 10 μm long, 2.0 μm wide; grains circular; grains

42-50-60 μm; flowering in Jul-Sep. (*S. Tsugaru and N. Sawada 15134*; Loc. K)

Primulaceae (1 genus, 3 species)

Tricolporate monad; exine 1.5-2.0 μm thick; sexine psilate; colpi acute at ends, constricted at equator; pori lalongate, H-shaped, with costae; compressed oval in equatorial view, circular in polar view; polar axis 21-33 μm, equatorial axis 18-24 μm, prolate; flowering in May-Aug.
ref. *Lysimachia fortunei* Maxim., 'Numatoranoo' (Jul-Aug): 4; *L. japonica* Thunb., 'Konasubi' (May-Jun): 1.

Lysimachia clethroides Duby 'Okatoranoo'
Exine 1.5-2.0 μm thick; apocolpium 8.0 μm wide; pori 10-11 × 2.0-2.5 μm wide, costae 2.0 μm thick; polar axis 25-29-33 μm, equatorial axis 18-20-23 μm, P/E ratio 1.33-1.48-1.73; flowering in Jun-Jul. (*Anonymous s.n.*, Loc. S)

Pyrolaceae (3 genera, 3 species)

Chimaphila and *Pyrola* (2 species)
Tricolporate tetrads; exine 2.0 μm thick; sexine verrucate, rugulate; colpi acute at ends, margo thickened; pori lalongate, with costae; tetrads tetrahedal; grains, polar axis 13-23 μm, equatorial axis 15-29 μm; flowering in Jun-Jul.
ref. *Chimaphila japonica* Miq., 'Umegasasou' (Jun-Jul): 1.

Pyrola japonica Klenze 'Ichiyakusou'
Colpi 7.0-10 μm long, margo 2.5 μm thick; pori 0.5-1.0 × 7.0-12 μm, costae 2.5 μm thick; grains, polar axis 17-20-23 μm, equatorial axis 22-26-29 μm; flowering in Jun-Jul. (*T. Takahashi and M. Sawada 1902*; Loc. K)

Monotropastrum (1 species)

Monotropastrum humile (D. Don) Hara 'Ginryousou'
Triporate monad; exine 1.0 μm thick; sexine scabrate; pori lolongate 5.0-6.0 × 4.0-5.0 μm wide, costae 1.2 μm thick; oval in equatorial view, semiangular in polar view; polar axis 20-21-23 μm, equatorial axis 23-25-28 μm, P/E ratio 0.77-0.85-0.90; flowering in May-Aug. (*H. Takahashi 914*; Loc. A)

Ranunculaceae (10 genera, 14 species)

Aconitum, Actaea, Anemone, Aquilegia, Caltha, Cimicifuga, Clematis and *Ranunculus* (11 species)
Tricolpate, stephanocolpate (4-6 colpate), pericolpate (6 colpate) monad; exine 1.5-2.2 μm thick; sexine baculate, bacula forming tectum on top, tectum scabrate, psilate; colpi long, usually ragged; oval in equatorial view, circular in polar view; polar axis 17-36 μm, equatorial axis 14-33 μm, oblate-spherical-prolate; flowering in Apr-Oct.

ref. *Actaea asiatica* Hara, 'Ruiyoushouma' (May-Jun): 3; *Anemone nikoensis* Maxim., 'Ichirinsou' (Apr-May): 4; *Aquilegia burgeriana* Sieb. et Zucc., 'Yamaodamaki' (Jun-Aug): 3; *Caltha palustris* L., 'Ryuukinka' (May-Jul): 4; *Cimicifuga simplex* Wormsk., 'Sarashinashouma' (Aug-Oct): 4; *Clematis japonica* Thunb., 'Hanshouduru' (May-Jun): 4.

1a. Stephanocolpate (6 colpate) ..... *Anemone flaccida*
1b. Pericolpate
2a. Bacula dense, >50 bacula/$10 \times 10\,\mu m^2$ ..... *Ranunculus silerifolius*
2b. Bacula scattered, 15-18 bacula/$10 \times 10\,\mu m^2$ ..... *R. japonicus*
1c. Tricolpate
3a. Polar axis <20 μm ..... *Clematis apiifolia*
3b. Polar axis >20 μm
4a. Colpi wide, distinctly verrucate ..... *Aconitum sanyoense*
4b. Colpi narrow
5a. Bacula dense, >50 per $10 \times 10\,\mu m^2$ ..... *Ranunculus silerifolius*
5b. Bacula scattered, 15-18 per $10 \times 10\,\mu m^2$ ..... *R. japonicus*

Aconitum sanyoense Nakai 'San'youbushi'
Tricolpate monad; exine 1.7 μm thick; tectum thick, psilate; colpi acute at ends, wide, ragged, apocolpium 6.0-7.0 μm wide, verrucate, verrucae 0.5-1.0 μm; polar axis 21-23-25 μm, equatorial axis 20-22-24 μm, P/E ratio 0.94-1.02-1.19; flowering in Sep-Oct. (*G. Nakai 5603*; Loc. A)

Anemone flaccida Fr. Schm. 'Nirinsou'
Stephanocolpate (6 colpate) monad; exine 2.0 μm thick; tectum perforate, scabrate; colpi ragged, apocolpium 5.0-7.0 μm wide; polar axis 20-23-26 μm, equatorial axis 22-24-27 μm, P/E ratio 0.76-0.93-1.05; flowering in Apr-May. (*Y. Imai s.n.*; Loc. H)

Clematis apiifolia DC. 'Botanduru'
Tricolpate monad; exine 1.9 μm thick; baculae varying in width, large and small bacula present, tectum scabrate; colpi acute at ends, apocolpium 6.0-8.0 μm wide; polar axis 17-19-20 μm, equatorial axis 17-20-23 μm, P/E ratio 0.87-0.97-1.07; flowering in Aug-Sep. (*G. Koidzumi s.n.*; Loc. A)

Ranunculus japonicus Thunb. 'Umanoashigata'
Tricolpate, pericolpate (4-6 colpate) monad; exine 2.2 μm thick; baculae varying in width, large and small bacula present, bacula scattered, 15-18/$10 \times 10\,\mu m^2$, tectum scabrate; colpi ragged, apocolpium 7.0-9.0 μm wide; polar axis 23-27-32 μm, equatorial axis 23-27-33 μm, P/E ratio 0.91-1.00-1.10; flowering in Apr-May. (*S. Okamoto s.n.*; Loc. A)

R. silerifolius Lév. 'Kitsunenobotan'
Tricolpate, pericolpate (4-6 colpate) monad; exine 2.1 μm thick; baculae varying in width, large and small bacula present, bacula scattered, >50/$10 \times 10\,\mu m^2$, tectum scabrate; colpi ragged, apocolpium 6.0-10 μm wide; grains 22-27-33 μm, spherical; flowering in Apr-Jul. (*S. Tsugaru and T. Takahashi 14200*; Loc. K)

Coptis and *Thalictrum* (3 species)
Periporate (10-15 porate) monad; exine 2.0 μm thick; sexine scabrate; pori circular 3.5-5.0 μm wide, annuli absent; grains circular; grains 18-24 μm; flowering in Mar-May and Jul-Sep.
ref. *Coptis japonica* (Thunb.) Makino, 'Ouren' (Apr): 1; *C. quinquefolia* Miq., 'Baikaouren' (Apr-May): 1; *Thalictrum minus* L., 'Akikaramatsu' (Jul-Sep): 4.

1a. Pori <12, <4.0 μm wide ..... *Thalictrum minus*
1b. Pori >12, >4.0 μm wide ..... *Coptis japonica, C. quinquefolia*

Rhamnaceae (3 genera, 5 species)

Tricolporate monad; exine 1.0-1.5 μm thick; sexine reticulate, rugulate, lumina <0.5-1.5 μm wide; colpi acute at ends, long, margo thickened; pori lalongate, with costae; compressed rhomboidal in equatorial view, angular in polar view; polar axis 14-26 μm, equatorial axis 16-25 μm, oblate-spherical-prolate; flowering in Apr-Aug.
ref. *Berchemia racemosa* Sieb. et Zucc., 'Kumayanagi' (Jul-Aug): 4; *Hovenia dulcis* Thunb., 'Kenponashi' (Jun-Jul): 4; *Rhamnus crenata* Sieb. et Zucc., 'Isonoki' (Jun-Jul): 4; *R. japonica* Maxim., 'Kuroumemodoki' (Apr-May): 3.

1a. Polar axis <18 μm, sexine rugulate ..... *Berchemia racemosa*
1b. Polar axis >18 μm
2a. Equatorial axis <21 μm, sexine reticulate, >1.0 μm wide lumina present ..... *Rhamnus crenata*
2b. Equatorial axis >21 μm, sexine reticulate, rugulate, lumina <0.5-1.0 μm wide ..... *Hovenia dulcis, Hovenia tomentella*

Hovenia tomentella (Makino) Nakai 'Kekenponashi'
Exine 1.0 μm thick; lumina <0.5 μm wide; apocolpium 5.0-6.0 μm wide, margo 2.0 μm wide; pori lalongate 5.0 × 2.0 μm wide, costae 1.0-1.5 μm thick; polar axis 18-20-22 μm, equatorial axis 21-24-25 μm, P/E ratio 0.75-0.85-1.00; flowering in Jun-Jul. (*S. Okamoto s.n.*; Loc. K)

Rosaceae (15 genera, 34 species)

Tricolporate monad; exine 0.5-2.5 μm thick; sexine striate, rugulate, verrucate, scabrate; colpi usually prominent and constricted at equator, acute at ends, operculum present in some species; pori lalongate, ragged 1.5-9.0 μm wide, if pori torn, pori variable in shape, with costae; oval in equatorial view, circular, semiangular in polar view; polar axis 12-40 μm, equatorial axis 10-44 μm, spherical-prolate; flowering in Apr-Oct.
ref. *Amelanchier asiatica* (Sieb. et Zucc.) Endl. ex Walp., 'Zaifuriboku' (Apr-May): 4; *Duchesnea chrysantha* (Zoll. et Mor.) Miq., 'Hebiichigo' (Apr-May): 1; *D. indica* (Andr.) Focke, 'Yabuhebiichigo' (Apr-Jun): 3; *Kerria japonica* (L.) DC., 'Yamabuki' (Apr-May): 4; *Potentilla centigrana* Maxim., 'Himehebiichigo' (Jun-Aug): 1; *P. cryptotaeniae* Maxim., 'Mitsumotosou' (Jul-Sep): 1; *P. fragarioides* L., 'Kijimushiro'

(Apr-May):1; *P. freyniana* Bornm., 'Mitsubatsuchiguri' (Apr-May):3; *P. stolonifera* Lehm., 'Tsurukiji-mushiro' (Apr-Jul): 1; *Pyrus pyrifolia* (Burm. fil.) Nakai, 'Yamanashi' (Apr):1; *Rubus hakonensis* Fr. et Sav., 'Miyamafuyuichigo' (Aug-Oct): 4; *R. hirsutus* Thunb., 'Kusaichigo' (Apr): 4; *Sorbus gracilis* (Sieb. et Zucc.) C. Koch, 'Nankinnanakamado' (Apr-Jun): 1.

1a. Polar axis <15 μm ..... *Aruncus dioicus*
1b. Polar axis >15 μm
  2a. Colpi with tectate operculum
    3a. Polar axis <23 μm ..... *Potentilla* (5 spp.) and *Duchesnea* (2 spp.)
    3b. Polar axis 23-29 μm ..... *Rosa multiflora*
    3c. Polar axis >29 μm ..... *Agrimonia nipponica*
  2b. Colpi without tectate operculum
    4a. Sexine scabrate, verrucate
      5a. Equatorial axis <24 μm ..... *Filipendula multijuga, Rubus crataegifolius*
      5b. Equatorial axis >24 μm ..... *Prunus incisa, Rubus buergeri, R. hakonensis*
    4b. Sexine striate, rugulate
      6a. Vallae coarse, distinct
        7a. Polar axis <20 μm ..... *Geum japonicum*
        7b. Polar axis >20 μm
          8a. Vallae usually parallel ..... *Prunus salicina, P. jamasakura*
          8b. Vallae irregular, rugulate ..... *Prunus incisa, P. grayana*
      6b. Vallae fine, indistinct
        9a. Pori torn, shape variable, H-shaped, >6.0 μm long, grains spherical
          10a. Pori, meridional axis >8.0 μm long, longer than equatorial axis
            ..... *Malus toringo, M. tschonoskii*
          10b. Pori, meridional axis <8.0 μm long, shorter than equatorial axis
            ..... *Pourthiaea, Sorbus alnifolia, S. americanus, S. japonicus*
        9b. Pori ragged, lalongate, <6.0 μm long, grains prolate-spherical
          11a. Equatorial axis >24 μm ..... *Rubus buergeri, R. hakonensis*
          11b. Equatorial axis <24 μm
            12a. Apocolpium >6.0 μm wide ..... *Rubus palmatus*
            12b. Apocolpium <6.0 μm wide
              ..*Rubus crataegifolius, R. illecebrosus, R. microphyllus, R. parvifloius*

Agrimonia nipponica Koidz. 'Himekinmizuhiki'

Exine 2.0-2.5 μm thick; sexine striate, verrucate; colpi equatorial prominent, apocolpium 8.0-9.0 μm wide, with tectate operculum; pori lalongate 8.0-9.0 × 4.0 μm wide, ragged, costae 2.0 μm thick; circular in polar view; polar axis 30-34-38 μm, equatorial axis 23-26-29 μm, P/E ratio 1.14-1.31-1.53; flowering in Aug-Sep. (*S. Okamoto s.n.*; Loc. A)

Aruncus dioicus (Walt.) Fern. 'Yamabukishouma'

Exine 0.5-1.0 μm thick; sexine striate; colpi equatorial prominent, apocolpium 2.5 μm wide; pori circular 1.5 μm wide; circular in polar view; polar axis 12-13-15 μm, equatorial axis 10-11-13 μm, P/E ratio 1.10-1.19-1.38 (n=12); flowering in Jun-Aug. (*G. Murata s.n.*; Loc. S)

Filipendula multijuga Maxim. 'Shimotsukesou'

Exine 1.7 μm thick; sexine scabrate; colpi acute at ends, constricted, slightly prominent at equator, apocolpium 4.0-5.0 μm wide; pori lalongate 0.5-1.5 × 3.0-4.0

μm, ragged, costae 1.0-1.5 μm thick; circular in polar view; polar axis 15-17-19 μm, equatorial axis 13-16-18 μm, P/E ratio 1.00-1.08-1.19; flowering in Jul-Aug. (*M. Tagawa 2075*; Loc. A)

Geum japonicum Thunb. 'Daikonsou'
Exine 1.5 μm thick; sexine rugulate, striate; colpi constricted and prominent at equator, apocolpium 4.0-5.0 μm wide; pori lalongate 2.0 × 5.0 μm, costae 1.0 μm thick; circular in polar view; polar axis 16-17-19 μm, equatorial axis 15-17-18 μm, P/E ratio 0.93-1.00-1.08; flowering in Jul-Aug. (*M. Hotta 15075*; Loc. A)

Malus toringo (Sieb.) Sieb. ex Vriese 'Zumi'
Exine 2.1 μm thick; sexine striate; colpi acute at ends, constricted and prominent at equator, apocolpium 4.0-6.0 μm wide; pori lolongate 15 × 10 μm wide, torn, costae 1.0 μm thick; circular in polar view; polar axis 21-25-30 μm, equatorial axis 22-28-33 μm, P/E ratio 0.70-0.93-1.11; flowering in May-Jun.(*S. Okamoto s.n.*; Loc. A)

M. tschonoskii (Maxim.) C. K. Schm. 'Oourajironoki'
Exine 2.0 μm thick; sexine striate; colpi acute at ends, constricted and prominent at equator, apocolpium 4.0-8.0 μm wide, margo thickened; pori lolongate 8.0-12 μm long, torn; circular in polar view; polar axis 23-27-30 μm, equatorial axis 22-25-28 μm, P/E ratio 0.90-1.07-1.34; flowering in May. (*G. Murata 18042*; Loc. K)

Pourthiaea villosa (Thunb.) Decne. 'Kamatsuka'
Exine 1.8 μm thick; sexine striate; colpi acute at ends, constricted and prominent at equator, apocolpium 3.0-5.0 μm wide; pori lalongate 3.0-4.0 × 6.0-8.0 μm, ragged; circular in polar view; polar axis 22-26-32 μm, equatorial axis 21-26-30 μm, P/E ratio 0.85-1.04-1.15; flowering in Apr-May. (*S. Kitamura s.n.*; Loc. K)

Prunus grayana Maxim. 'Uwamizuzakura'
Exine 1.5-2.0 μm thick; sexine striate, rugulate; colpi constricted and prominent at equator, apocolpium 6.0-8.0 μm wide; pori lalongate 3.0-4.0 × 6.0-7.0 μm, ragged; circular in polar view; polar axis 22-26-29 μm, equatorial axis 22-25-28 μm, P/E ratio 0.90-1.04-1.16; flowering in Apr-May. (*E. Araki 4778*; Loc. K)

P. incisa Thunb. 'Kinkimamezakura'
Exine 2.0 μm thick; sexine striate, scabrate; colpi equatorial prominent, apocolpium 4.0-7.0 μm wide; pori lalongate 3.0-4.0 × 8.0-9.0 μm, ragged; circular in polar view; polar axis 23-28-34 μm, equatorial axis 26-29-33 μm, P/E ratio 0.87-0.99-1.17 (n=21); flowering in Apr-May. (*T. Fujii T-1812*; Loc. S)

P. jamasakura Sieb. ex Koidz. 'Yamazakura'
Exine 1.8-2.0 μm thick; sexine striate, striae 0.5-1.0 μm wide; colpi prominent and constricted at equator, apocolpium 7.0-11 μm wide; pori lalongate 5.0-9.0 μm wide, ragged variable in shape, costae 3.0 μm thick; semiangular in polar view; polar axis 22-29-35 μm, equatorial axis 25-30-34 μm, P/E ratio 0.75-0.99-1.17; flowering in Apr-May. (*H. Nagamasu 4493*; Loc. A)

P. salicina Lindley 'Sumomo'
Exine 1.5 μm thick; sexine striate, striae 0.5 μm wide; colpi prominent and constricted at equator, apocolpium 7.0-9.0 μm wide; pori lolongate-circular 6.0-9.0 × 4.0-7.0 μm, ragged variable in shape, costae 3.0-5.0 μm thick; circular in polar view; polar axis 25-30-35 μm, equatorial axis 22-28-32 μm, P/E ratio 0.87-1.07-1.27; flowering in Apr-May. (*G. Murata s.n.*; Loc. K)

Rosa multiflora Thunb. 'Noibara'
Exine 1.5-2.0 μm thick; sexine rugulate; colpi prominent and constricted at equator, apocolpium 6.0-7.0 μm wide, with tectate operculum; pori lalongate 2.0-3.0 × 7.0-8.0 μm, ragged, costae 1.5-2.0 μm thick; circular in polar view; polar axis 23-26-28 μm, equatorial axis 18-21-24 μm, P/E ratio 1.11-1.21-1.40; flowering in May-Jun. (*G. Murata 19733*; Loc. K)

Rubus buergeri Miq. 'Fuyuichigo'
Exine 2.4 μm thick; sexine verrucate, rugulate; colpi acute at ends, prominent and constricted at equator, apocolpium 5.0-8.0 μm wide; pori lalongate 6.0-9.0 × 3.0-4.0 μm wide, costae 1.5-2.0 μm thick; circular in polar view; polar axis 31-35-40 μm, equatorial axis 32-37-44 μm, P/E ratio 0.91-0.96-1.00 (n=6); flowering in Aug-Oct. (*G. Nakai 4183*; Loc. K)

R. crataegifolius Bunge 'Kumaichigo'
Exine 1.8 μm thick; sexine scabrate, rugulate; colpi acute at ends, prominent and constricted at equator, apocolpium 3.0 μm wide; pori lalongate 2.5-3.0 × 5.0-7.0 μm, costae 1.0-1.5 μm thick; circular in polar view; polar axis 18-22-25 μm, equatorial axis 12-16-19 μm, P/E ratio 1.13-1.42-1.90; flowering in Apr-Jun. (*T. Yamazaki 21*; Loc. K)

R. illecebrosus Focke 'Baraichigo'
Exine 1.5 μm thick; sexine striate, rugulate; colpi acute at ends, prominent and constricted at equator, apocolpium 3.0-4.0 μm wide; pori lalongate 2.5 × 6.0 μm, costae 2.0 μm thick; circular in polar view; polar axis 17-19-22 μm, equatorial axis 15-17-20 μm, P/E ratio 1.00-1.12-1.33; flowering in Jun-Jul. (H. Takahashi 852; Loc. A)

R. microphyllus L. 'Nigaichigo'
Exine 1.0-1.5 μm thick; sexine striate, rugulate; colpi acute at ends, prominent and constricted at equator, apocolpium 3.0-5.0 μm wide; pori lalongate 2.0 x 6.0 μm wide, costae 2.0 μm thick; circular in polar view; polar axis 17-19-22 μm, equatorial axis 15-16-19 μm, P/E ratio 1.00-1.17-1.25; flowering in Apr-May. (*G. Murata 18013*; Loc. K)

R. palmatus Thunb. 'Nagabanomomijiichigo'
Exine 1.5 μm thick; sexine striate, rugulate; colpi acute at ends, equatorial prominent, apocolpium 7.0-8.0 μm wide; pori lalongate 2.0 × 5.0 μm, costae 2.0 μm thick; circular in polar view; polar axis 21-25-29 μm, equatorial axis 17-21-24 μm,

P/E ratio 1.00-1.20-1.53; flowering in May-Jun. (*G. Murata 7036*; Loc. A)

R. parvifolius L. 'Nawashiroichigo'
Exine 1.5 μm thick; sexine striate, rugulate; colpi acute at ends, prominent and constricted at equator, apocolpium 4.0 μm wide; pori lalongate 3.0-4.0 μm wide, ragged, costae 1.5-2.0 μm thick; circular in polar view; polar axis 17-19-22 μm, equatorial axis 16-18-20 μm, P/E ratio 0.87-1.01-1.14; flowering in May-Jul. (*T. Takahashi 1178*; Loc. K)

Sorbus alnifolia (Sieb. et Zucc.) C. Koch. 'Azukinashi'
Exine 1.5 μm thick; sexine striate, scabrate; colpi acute at ends, prominent and constricted at equator, apocolpium 4.0-5.0 μm wide; pori lalongate 4.0 × 8.0 μm, torn, H-shaped, costae 2.0 μm thick; semiangular in polar view; polar axis 20-23-25 μm, equatorial axis 22-25-27 μm, P/E ratio 0.81-0.95-1.06; flowering in May-Jun. (*G. Murata et al. 1173*; Loc. A)

S. americana Marsh. ssp. *japonica* (Maxim.) Kitam. 'Nanakamado'
Exine 1.7 μm thick; sexine striate, scabrate; colpi acute at ends, prominent and constricted at equator, apocolpium 4.0-5.0 μm wide; pori variable in shape 5.0-8.0 μm wide, torn, costae 1.0 μm thick; circular in polar view; polar axis 18-21-24 μm, equatorial axis 18-20-23 μm, P/E ratio 0.94-1.02-1.13; flowering in May-Jul. (*M. Ito et al. 1288*; Loc. A)

S. japonica (Decne.) Hedlund 'Urajironoki'
Exine 1.6 μm thick; sexine striate, scabrate; colpi acute at ends, prominent and constricted at equator, apocolpium 4.0-6.0 μm wide; pori variable in shape 6.0-8.0 μm wide, torn, costae 1.0-1.5 μm thick; circular in polar view; polar axis 22-25-29 μm, equatorial axis 21-24-27 μm, P/E ratio 0.90-1.06-1.35; flowering in May-Jun. (*H. Nagamasu 93*; Loc. S)

Rubiaceae (5 genera, 11 species)

Galium and *Rubia* (8 species)
Stephanocolpate (6-8 colpate) monad; exine 2.0 μm thick; sexine baculate, baucula forming perforate tectum, or reticulate, lumina <0.5 μm wide; colpi sunken, long, narrow; oval in equatorial view, circular in polar view; grains 14-26 μm, spherical; flowering in May-Sep.
ref. *Galium kinuta* Nakai et Hara, 'Kinutasou' (Jul-Aug): 4; *G. spurium* L., 'Yaemugura' (May-Jun): 3; *G. tokyoense* Makino, 'Hanamugura' (May-Jul): 1; *G. trachyspermum* A. Gray, 'Yotsubamugura' (May-Jun): 3; *G. trifloriforme* Komar., 'Kurumamugura' (Jun-Jul): 1; *G. verum* L., 'Kawaramatsuba' (Jul-Aug): 4; *Rubia argyi* (Lêv.) Hara, 'Akane' (Aug-Sep): 4; *R. chinensis* Regel et Maack, 'Ookinutasou' (May-Jul): 1.

Hedyotis (1 species)

Hedyotis lindleyana Hook. 'Hashikagusa'
Stephanocolporate (5-8 colporate) monad; exine 2.0 μm thick; sexine reticulate, lumina 1.0-2.0 μm wide, muri simplicolumellate; colpi short 10 μm long; pori lalongate, indistinct; oval in equatorial view, circular in polar view; grains 18-21 μm, spherical; flowering in Aug-Sep. (ref. 3)

Mitchella (1 species)

Mitchella undulata Sieb. et Zucc. 'Tsuruaridooshi'
Tricolporate monad; exine 2.0 μm thick; sexine reticulate, lumina 1.0 μm wide; colpi long, acute at ends; pori lalongate; oval in equatorial view, circular in polar view; polar axis 28-32 μm, equatorial axis 25-30 μm, prolate-spherical; flowering in Jun-Jul. (ref. 3)

Paederia (1 species)

Paederia scadens (Lour.) Merrill 'Hekusokazura'
Tricolpate monad; exine 1.8 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide; colpi acute at ends, long, narrow; oval in equatorial view, circular in polar view; polar axis 30-35 μm, equatorial axis 32-38 μm, oblate-spherical; flowering in Aug-Sep. (ref. 4)

Rutaceae (4 genera, 6 species)

Boennighausenia, Phellodendron and *Zanthoxylum* (5 species)
Tricolporate monad; exine 1.2-2.0 μm thick; sexine reticulate, lumina <0.5-3.5 μm wide; colpi long, acute at ends; pori lalongate, with costae; oval in equatorial view, circular, semiangular in polar view; polar axis 21-33 μm, equatorial axis 14-29 μm, prolate; flowering in Apr-Oct.
ref. *Boennighausenia japonica* Nakai, 'Matsukazesou' (Aug-Oct): 4; *Zanthoxylum ailanthoides* Sieb. et Zucc., 'Karasuzanshou' (Jul-Aug): 4; *Z. piperitum* (L.) DC., 'Sanshou' (Apr-May): 4; *Z. schinifolium* Sieb. et Zucc., 'Inuzanshou' (Aug-Sep): 4.

1a. Lumina <1.0 μm wide
  2a. Polar axis >25 μm ..... *Boennighausenia japonica*
  2b. Polar axis <25 μm ..... *Zanthoxylum pipericum*
1b. Lumina >1.0 μm wide
  3a. Equatorial axis >22 μm ..... *Phellodendron amurense*
  3b. Equatorial axis <22 μm
    4a. Lumina larger, >2.5 μm wide lumina present ..... *Z. ailanthoides*
    4b. Lumina smaller, 1.0-2.5 μm wide ..... *Z. schinifolium*

Phellodendron amurense Rupr. 'Kihada'
Exine 2.0 μm thick; lumina 1.0-2.0 μm wide, muri simplicolumellate; apocolpium 5.0 μm wide, margo thinned; pori lalongate 2.5 × 8.0 μm, costae 2.0-2.5 μm thick; circular in polar view; polar axis 26-30-33 μm, equatorial axis 22-26-29 μm, P/E ratio 0.91-1.14-1.30; flowering in Jun. (*G. Koidzumi s.n.*; Loc. K)

Skimmia (1 species)

Skimmia japonica Thunb. 'Tsurushikimi'
Stephanocolporate (5 colporate) monad; exine 2.0-2.5 μm thick; sexine striate, striae 0.5 μm wide; colpi acute at ends, 0.5-1.0 μm wide, apocolpium 6.0-9.0 μm wide; pori lalongate 5.0-6.5 × 0.5-3.0 μm, costae 1.5-2.0 μm thick; oval in equatorial view, circular in polar view; polar axis 30-32-40 μm, equatorial axis 26-30-37 μm, P/E ratio 0.96-1.07-1.20; flowering in Apr-May. (*H. Nagamasu 4504*; Loc. A)

Sabiaceae (1 genus, 2 species)

Tricolporate monad; exine 1.5 μm thick; sexine reticulate, lumina 0.5-1.0 μm wide; colpi acute at ends, margo thickened; pori lalongate, with costae; oval in equatorial view, circular in polar view; polar axis 17-22 μm, equatorial axis 14-18 μm, prolate; flowering in May-Jul.
ref. *Meliosma myriantha* Sieb. et Zucc., 'Awabuki' (Jun-Jul): 4.

Meliosma tenuis Maxim. 'Miyamahahaso'
Apocolpium 4.0-5.0 μm wide; pori 1.0-1.5 × 6.0-7.0 μm, costae 1.0 μm thick; polar axis 17-20-22 μm, equatorial axis 15-16-18 μm, P/E ratio 1.00-1.27-1.42; flowering in May-Jul. (*G. Nakai 3295*; Loc. K)

Salicaceae (2 genera, 4 species)

Populus (1 species)

Populus sieboldii Miq. 'Yamanarashi'
Inaparturate monad; exine 1.5 μm thick; sexine verrucate, verrucae occasionally forming broken reticulum; grains circular; grains 21-28 μm; flowering in Apr. (ref. 4)

Salix (3 species)
Tricolpate monad; exine 1.0-1.5 μm thick; sexine reticulate, lumina 1.0-2.0 μm wide, smaller near colpi; colpi acute at ends, margo thinned; oval in equatorial view, circular in polar view; polar axis 16-26 μm, equatorial axis 11-20 μm, prolate; flowering in Mar-May.
ref. *Salix sachalinensis* Fr. Schm., 'Onoeyanagi' (Apr-May): 4; *S. sieboldiana* Blume, 'Yamayanagi' (Mar-Apr): 4.

Salix gracilistyla Miq. 'Nekoyanagi'
Apocolpium 3.0-4.0 μm wide; polar axis 16-18-21 μm, equatorial axis 12-14-17 μm, P/E ratio 1.15-1.28-1.46; flowering in Mar-Apr. (*Y. Araki s.n.*; Loc. K)

Santalaceae (2 genera, 2 species)

Buckleya (1 species)

Buckleya lanceolata (Sieb. et Zucc.) Miq. 'Tsukubane'

Tricolporate monad; exine 1.5-2.0 μm thick; sexine striate; colpi acute at ends, apocolpium 6.0-7.0 μm wide, prominent at equator, margo thinned; pori lolongate 4.0 × 3.0 μm, costae 1.0 μm thick; oval in equatorial view, circular, semiangular in polar view; polar axis 21-25-28 μm, equatorial axis 21-23-26 μm, P/E ratio 0.92-1.11-1.23; flowering in May-Jun. (*G. Murata 19709*; Loc. K)

Thesium (1 species)

Thesium chinense Turcz. 'Kanabikisou'
Syncolpate monad; sexine reticulate, lumina 2.0-3.0 μm wide; 3 colpori joining at proximal pole; pyramid shape in equatorial view, angular in polar view; grains 21-29; flowering in Apr-Jun. (ref. 4)

Saururaceae (1 genus, 1 species)

Houttuynia cordata Thunb. 'Dokudami'
Inaperturate, monocolpate monad; exine 1.0 μm thick; sexine scabrate; colpi indistinct; grains circular, elliptic; grains 8-13-17 μm; flowering in Jun-Jul (*S. Tsugaru 16654*; Loc. A)

Saxifragaceae (13 genera, 21 species)

Deinanthe (1 species)

Deinanthe bifida Maxim. 'Ginbaisou'
Tricolpate monad; exine 2.0 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide; colpi short 10-15 μm long, acute at ends, narrow, margo thickened; oval in equatorial view, circular in polar view; grains 27-33 μm, spherical; flowering in Jul-Aug. (ref. 4)

Ribes (1 species)

Ribes ambiguum Maxim. 'Yashabishaku'
Stephanocolporate (6-7 colporate) monad; exine 1.5 μm thick; sexine scabrate; colpi rounded at ends, irregular; pori circular 2.0-3.5 μm wide, simetimes 2 pori share the same colpi; oval in equatorial view, circular in polar view; grains 19-26 μm, spherical; flowering in Apr-May. (ref. 1)

Saxifraga (1 species)

Saxifraga fortunei Hook. fil. 'Daimonjisou'
Tricolpate, stephanocolpate (4 colpate) monad; exine 2.0 μm thick; sexine baculate, baculae forming tectum on top, tectum reticulate, lumina 0.5 μm wide; colpi long, acute at ends; oval in equatorial view, circular in polar view; polar axis 19-26 μm, equatorial axis 16-24 μm, prolate; flowering in Jul-Oct. (ref. 4)

Astilbe, Cardiandra, Chrysosplenium, Deutzia, Hydrangea, Mitella, Parnassia, Philadelphus, Rodgersia and *Schizophragma* (18 species)

Tricolporate monad; exine 1.0-2.0 μm thick; sexine reticulate, lumina <0.5-1.5 μm wide; colpi acute at ends, long, usually constricted, occasionally prominent at equator, apocolpium 1.0-5.0 μm wide; pori lalongate sometimes indistinct 1.0-4.0 μm wide , or circular 3.5 μm wide, with costae; oval in equatorial view, circular in polar view; polar axis 7-29 μm, equatorial axis 7-24 μm, prolate-spherical; flowering in Mar-Oct.

ref. *Chrysosplenium grayanum* Maxim., 'Nekonomesou' (Apr-May): 1; *C. japonicum* (Maxim.) Makino, 'Yamanekonomesou' (Mar-Apr): 4; *C. macrostemon* Maxim., 'Iwabotan' (Apr): 1; *Deutzia gracilis* Sieb. et Zucc., 'Himeutsugi' (May-Jun): 4; *Parnassia palustris* L., 'Umebachisou' (Aug-Oct): 4; *Rodgersia podophylla* A. Gray, 'Yagurumasou' (Jun-Jul): 1.

1a. Pori circular and >3.0 μm wide, >1.0 μm wide lumina present ..... *Parnassia palustris*
1b. If pori >3.0 μm wide, pori lalongate; or if pori <3.0 μm wide, lumina <1.0 μm wide
2a. Polar axis >15 μm
3a. Lumina 1.0 μm wide ..... *Deutzia crenata*
3b. Luimna <0.5 μm wide
4a. Pori >3.0 μm wide, grains prolate ..... *Philadelphus satsumi*
4b. Pori <3.0 μm wide, grains spherical-prolate
..Chrysosplenium fauriei, Hydrangea paniculata, Mitella acerina, M. furusei
2b. Polar axis <15 μm
5a. Pori >3.0 μm wide, 1.0 μm wide lumina present ..... *Hydrangea petiolaris*
5b. Pori <3.0 μm wide, lumina <0.5 μm wide
6a. Apocolpium >3.0 μm wide
7a. Equatorial axis <13 μm ..... *Astilbe thunbergii*
7b. Equatorial axis >13 μm ..... *Mitella furusei*
6b. Apocolpium <3.0 μm wide
8a. Colpi equatorial prominent ..... *Schizophragma hydrangeoides*
8b. Colpi not equatorial prominent
.....Cardiandra alternifolia, Chrysosplenium fauriei, Hydrangea hirta, H. serrata, Rodgersia podophylla

Astilbe thunbergii (Sieb. et Zucc.) Miq. 'Akashouma'
Exine 1.0 μm thick; lumina <0.5 μm wide; colpi equatorial prominent, apocolpium 3.0-3.5 μm wide; pori lalongate 0.5 × 2.0 μm; polar axis 11-12-13 μm, equatorial axis 10-12-13 μm, P/E ratio 0.90-1.03-1.13; flowering in Jul-Aug. (*S. Okamoto s.n.;* Loc. A)

Cardiandra alternifolia Sieb. et Zucc. 'Kusaajisai'
Exine 1.0 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 2.0-2.5 μm wide; pori lalongate 0.5 × 2.0 μm, indistinct; polar axis 10-12-13 μm, equatorial axis 10-10-12 μm, P/E ratio 1.00-1.17-1.25; flowering in Jul-Sep. (*M. Tagawa 1739*; Loc. A)

Chrysosplenium fauriei Franch. 'Botannekonomesou'
Exine 1.2 μm thick; lumina <0.5 μm wide; colpi ragged, apocolpium 1.0-3.0 μm wide;

pori lalongate 0.5-1.5 × 2.0-3.0 μm, castae 0.5 μm thick; polar axis 13-16-19 μm, equatorial axis 12-14-17 μm, P/E ratio 0.91-1.14-1.30; flowering in May. (*G. Koidzumi s.n.*; Loc. K)

Deutzia crenata Sieb. et Zucc. 'Utsugi'
Exine 1.5 μm thick; lumina 1.0 μm wide; colpi constricted at equator, apocolpium 3.0 μm wide; pori lalongate 0.5 × 2.5 μm; polar axis 15-17-19 μm, equatorial axis 15-17-19 μm, P/E ratio 0.80-1.05-1.17; flowering in May-Jun. (*S. Okamoto s.n.*; Loc. A)

Hydrangea hirta (Thunb. ex Murray) Sieb. et Zucc. 'Koajisai'
Exine 1.0 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 2.5-3.0 μm wide; pori lalongate 0.5 × 2.0 μm; polar axis 12-13-15 μm, equatorial axis 10-11-13 μm, P/E ratio 1.00-1.18-1.38; flowering in Jun-Jul. (*H. Nagamasu 163*; Loc. K)

H. paniculata Sieb. et Zucc. 'Noriutsugi'
Exine 1.2 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 3.0-4.0 μm wide; pori lalongate 0.5 × 2.0-3.0 μm; polar axis 15-16-18 μm, equatorial axis 12-15-18 μm, P/E ratio 1.00-1.12-1.30; flowering in Jul-Aug. (*Mitsuda and Takamiya s.n.*; Loc. A)

H. petiolaris Sieb. et Zucc. 'Tsuruajisai'
Exine 1.0 μm thick; lumina 0.5-1.0 μm wide; colpi prominent at equator, apocolpium 2.0-3.0 μm wide; pori lalongate, circular 1.0-3.0 × 3.0-4.0 μm, costae 0.5 μm thick; polar axis 10-12-13 μm, equatorial axis 10-12-13 μm, P/E ratio 0.88-0.98-1.13; flowering in Jun. (*H. Takahashi 932*; Loc. A)

H. serrata (Thunb. ex Murray) Seringe 'Yamaajisai'
Exine 1.0 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 1.0-2.0 μm wide; pori lalongate 0.5 × 2.0 μm, indistinct; polar axis 10-13-15 μm, equatorial axis 10-11-14 μm, P/E ratio 0.90-1.16-1.38; flowering in Jun-Jul. (*H. Nagamasu 149*; Loc. K)

Mitella acerina Makino 'Momijicharumerusou'
Exine 1.6 μm thick; lumina <0.5 μm wide; colpi constricted at equator, apocolpium 3.0-4.0 μm wide; pori lalongate, circular 1.0-1.5 μm wide, ragged, costae 1.5 μm thick; polar axis 17-20-23 μm, equatorial axis 15-18-20 μm, P/E ratio 0.93-1.11-1.34; flowering in Apr-Jun. (*H. Nagamasu 4505*; Loc. A)

M. furusei Ohwi 'Charumerusou'
Exine 1.4 μm thick; lumina <0.5 μm wide; colpi apocolpium 4.0-4.5 μm wide; pori lalongate 1.0-1.5 × 2.0-3.0 μm, costae 1.0 μm thick; polar axis 12-15-18 μm, equatorial axis 13-16-18 μm, P/E ratio 0.78-0.96-1.17; flowering in Apr-May. (*H. Nagamasu 4467*; Loc. A)

Philadelphus satsumi Sieb. ex Lindl. et Paht. 'Baikautsugi'
Exine 1.1 μm thick; lumina <0.5 μm wide; colpi equatorial prominent, apocolpium

3.0 μm wide; pori lalongate 0.5-1.0 × 3.0-4.0 μm, costae 1.0 μm thick; polar axis 15-16-18 μm, equatorial axis 12-13-15 μm, P/E ratio 1.08-1.25-1.40; flowering in Jun-Jul. (*M. Hiroe 18038*; Loc. K)

Schizophragma hydrangeoides Sieb. et Zucc. 'Iwagarami'
Exine 1.1 μm thick; lumina 0.5 μm wide; colpi prominent and constricted at equator, apocolpium 2.0-3.0 μm wide; pori lalongate, circular 1.5-2.0 × 2.0-3.0 μm, costae 1.0 μm thick; polar axis 11-12-14 μm, equatorial axis 10-12-13 μm, P/E ratio 0.90-1.06-1.25; flowering in May-Jul. (*S. Okamoto s.n.*; Loc. A)

Schisandraceae (1 genus, 1 species)

Schisandra nigra Maxim. 'Matsubusa'
Syncolpate (6 colpate) monad; exine 1.5-2.0 μm thick; sexine reticulate, lumina 1.0-2.5 μm wide, muri simplicolumellate; 6 colpi meridional, 3 of them joining at the poles, colpi 0.5-1.0 μm wide, margo thinned; oval in equatorial view, circular in polar view; polar axis 17-20-23 μm, equatorial axis 24-27-30 μm, P/E ratio 0.77-0.85-0.97; flowering in Jun-Jul. (*T. Tashiro s.n.*; Loc. S)

Sciadopityaceae (1 genus, 1 species)

Sciadopitys verticillata (Thunb.) Sieb. et Zucc. 'Kouyamaki'
Monoporate monad; exine 2.0-3.0 μm thick in proximal face; sexine verrucate, verrucae 2.0-3.0 μm wide, 1.5-2.0 μm high, formed by some bacula; pori circular 20-25 μm wide; grains circular, elliptic; grains 27-33-40 μm; flowering in Mar-Apr. (*G. Murata 16133*; Loc. S)

Scrophuraliaceae (7 genera, 10 species)

Deinostema, Mazus and *Mimulus* (4 species)
Tricolporate monad; exine 1.8-4.0 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi acute at ends, margo thinned; pori lalongate; oval in equatorial view, circular in polar view; polar axis 18-24 μm, equatorial axis 17-26 μm, spherical-prolate; flowering in Apr-Oct.
ref. *Mazus miquelii* Makino, 'Sagigoke' (Apr-May): 4; *M. pumilus* (Burm. fil.) van Steenis, 'Tokiwahaze' (Apr-Oct): 1; *Mimulus nepalensis* Benth., 'Mizohoozuki' (Jun-Aug): 1.

Deinostema adenocaulum (Maxim.) Yamazaki 'Marubanosawatougarashi'
Exine 4.0 μm thick; apocolpium 5.0 μm wide; pori 5.0 × 3.0 μm wide, costae 0.5 μm thick; polar axis 18-21-23 μm, equatorial axis 17-20-23 μm, P/E ratio 0.93-1.03-1.11; flowering in Aug-Oct. (*S. Hosomi 9007*; Loc. K)

Pedicularis (1 species)

Pedicularis resupinata L. 'Shiogamagiku'

Syncolpate monad; exine 1.2 μm thick; sexine psilate; 2 colpi joining at the pole s, ring-shaped; oval in equatorial view, circular in polar view, sometimes broken along the colpi; grains 16-24 μm, spherical-prolate; flowering in Aug-Sep. (ref. 4)

Lindernia, Melampyrum and *Veronica* (5 species)
Tricolpate monad; exine 1.0-2.0 μm thick; sexine baculate, bacula forming tectum, tectum scabrate; colpi acute at ends, long, if wide, ragged and verrucate, if narrow, sometimes exine thinner in mesocolpia; oval, compressed oval in equatorial view, circular, triangular in polar view; polar axis 14-32 μm, equatorial axis 10-29 μm, spherical; flowering in May-Oct.
ref. *Lindernia angustifolia* (Benth.) Wettst., 'Azetougarashi' (Aug-Oct): 4; *L. procumbens* (Krock.) Philcox, 'Azena' (Aug-Oct): 1; *Melampyrum laxum* Miq., 'Miyamamamakona' (Aug-Sep): 3; *M. roseum* Maxim., 'Mamakona' (Jul-Sep): 1; *Veronica miqueliana* Nakai, 'Kokuwagata' (May-Jun): 1.

1a. Polar axis >25 μm, colpi wide, ragged, verrucate ..... *Veronica miqueliana*
1b. Polar axis <20 μm, colpi narrow, sharp
2a. Exine thinner, concave in the center between colpi, compressed oval in equatorial view, angular in polar view ..... *Melampyrum laxum*
2b. Exine not thinner in the center between colpi, oval in equatorial view, circular, semiangular in polar view ..... *Lindernia angustifolia*

Solanaceae (5 genera, 6 species)

Scopolia (1 species)

Scopolia japonica Maxim. 'Hashiridokoro'
Tricolpate, stephanocolpate (4-5 colpate) monad; exine 1.2 μm thick; sexine verrucate, verrucae 0.5-1.0 μm wide; colpi indistinct, ragged; grains irregularly circular; grains 41-45 μm, spherical; flowering in Apr-May. (ref. 4)

Physaliastrum, Physalis, Solanum and *Tubocapsicum* (5 species)
Tricolporate monad; exine 1.2-1.8 μm thick; sexine scabrate; colpi long, acute at ends or rounded at ends, constricted and prominent at equator, margo thickened; pori lalongate, with costae oval, rhomboidal in equatorial view, semiangular in polar view; polar axis 9-26 μm, equatorial axis 12-27 μm, spherical-oblate; flowering in Jun-Sep.
ref. *Physaliastrum japonicum* (Fr. et Sav.) Honda, 'Igahoozuki' (Jun-Aug): 1; *Physalis alkekengi* L., 'Hoozuki' (Jun-Jul): 4; *Solanum japonense* Nakai, 'Yamahoroshi' (Jul-Aug): 4; *S. lyratum* Thunb., 'Hiyodorijougo' (Aug-Sep): 4;, *Tubocapsicum anomalum* (Fr. et Sav.) Makino, 'Hadakahoozuki' (Aug-Sep): 1.

1a. Polar axis >23 μm ..... *Physalis alkekengi*
1b. Polar axis 16-23 μm ..... *Physaliastrum japonicum, Tubocapsicum anomalum*
1c. Polar axis <16 μm ..... *Solanum japonense, S. lyratum*

Sparganiaceae (1 genus, 1 species)

Sparganium erectum L. 'Mikuri'
Monoporate monad; exine 2.0 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide, muri simplicolumellate; pori circular 2.0-3.0 μm wide, annulus absent; grains circular; grains 21-24-28 μm; flowering in Jun-Aug. (*S. Watanabe s.n.*; Loc. S)

Stachyuraceae (1 genus, 1 species)

Stachyurus praecox Sieb. et Zucc. 'Kibushi'
Tricolporate monad; exine 1.0-1.5 μm thick; sexine scabrate; colpi acute at ends, equatorial prominent, apocolpium 6.0 μm wide; pori lalongate, meridionally constricted, 3.0 × 8.0-9.0 μm, costae 2.0 μm thick; oval in equatorial view, hexagonal in polar view; polar axis 18-20-23 μm, equatorial axis 17-20-22 μm, P/E ratio 0.94-1.02-1.14; flowering in Mar-Apr. (*N. Kinashi s.n.*; Loc. K)

Styracaceae (2 genera, 3 species)

Tricolporate monad; exine 1.8-2.0 μm thick; sexine verrucate, rugulate, scabrate; colpi acute at ends, prominent and constricted at equator, apocolpium 5.0-9.0 μm wide, margo thickened; pori lalongate, ragged, H-shaped, 2.0-7.0 × 7.0-9.0 μm, costae 1.5-3.0 μm thick; oval, rhomboidal in equatorial view, angular, semiangular in polar view; polar axis 22-38 μm, equatorial axis 25-36 μm, spherical-oblate; flowering in May-Jun.

1a. Polar axis <29 μm, grains oblate ..... *Pterostyrax hispida*
1b. Polar axis >29 μm, grains spherical
2a. Pori >5.0 μm wide, costae >2.0 μm thick ..... *Styrax japonica*
2b. Pori <5.0 μm wide, costae <2.0 μm thick ..... *Styrax obassia*

Pterostyrax hispida Sieb. et Zucc. 'Oobaasagara'
Exine 1.9 μm thick; sexine verrucate, rugulate; apocolpium 5.0-7.0 μm wide; pori ragged, H-shaped, 2.0-3.0 × 7.0-8.0 μm, costae 1.5 μm thick; semiangular in polar view; polar axis 22-25-29 μm, equatorial axis 25-28-30 μm, P/E ratio 0.79-0.89-1.05; flowering in Jun. (*M. Hotta 11276*; Loc. K)

Styrax japonica Sieb. et Zucc. 'Egonoki'
Exine 2.0 μm thick; sexine verrucate, scabrate; apocolpium 6.0-9.0 μm wide; pori ragged, 7.0 × 9.0 μm, costae 2.0-3.0 μm thick; angular in polar view; polar axis 31-33-38 μm, equatorial axis 30-33-36 μm, P/E ratio 0.89-1.00-1.17; flowering in May-Jun. (*H. Nagamasu 159*; Loc. K)

S. obassia Sieb. et Zucc. 'Hakuunboku'
Exine 1.8 μm thick; sexine verrucate, scabrate; apocolpium 5.0-6.0 μm wide; pori ragged, variable in shape, 4.0 × 7.0 μm, costae 1.5-2.0 μm thick; semiangular in polar view; polar axis 28-32-37 μm, equatorial axis 27-32-35 μm, P/E ratio 0.88-1.01-1.13; flowering in May-Jun. (*S. Fujii and H. Kudo 2463*; Loc. A)

Symplocaceae (1 genus, 2 species)

Tricolporate monad; exine 2.0 μm thick; sexine reticulate, rugulate, lumina 1.0-2.0 μm wide; colpi short 7.0-8.0 μm long, acute, margo thickened; pori lalongate 3.0 × 5.0-7.0 μm, with costae oval in equatorial view, angular, lobate in polar view; polar axis 15-23 μm, equatorial axis 26-33 μm, oblate; flowering in May-Jun.
ref. *Symplocos coreana* (Lév.) Ohwi, 'Tannasawafutagi' (Jun): 4.

Symplocos sawafutagi Nagamasu 'Sawafutagi'
Pori lalongate 3.0 × 5.0-6.0 μm, with costae polar axis 15-18-23 μm, equatorial axis 26-28-33 μm, P/E ratio 0.54-0.63-0.75; flowering in May-Jun. (*A. Nitta 11946*; Loc. A)

Taxaceae (2 genera, 2 species)

Inaperturate monad; exine 0.5-1.0 μm thick; sexine scabrate; ridged in proximal face, circular in polar view; grains 17-36 μm; flowering in Mar-May.
ref. *Taxus cuspidata* Sieb. et Zucc., 'Ichii': 4.

Torreya nucifera (L.) Sieb. et Zucc. var. *radicans* Nakai 'Chabogaya'
Grains 17-21-25 μm; flowering in Mar-May. (*T. Horikawa 352*; Loc. A)

Taxodiaceae (1 genus, 1 species)

Cryptomeria japonica (L. fil.) var. *radicans* Nakai 'Ashiusugi'
Monoporate monad; exine 1.0-1.5 μm thick; sexine scabrate, gemmate; pore prominent, 3.0-6.0 μm high, 2.0-6.0 μm wide; grains circular; grains 20-23-27 μm; flowering in Mar-Apr. (*G. Murata 70520*; Loc. K)

Theaceae (3 genera, 4 species)

Tricolporate monad; exine 1.0-3.3 μm thick; sexine reticulate, lumina 0.5 μm wide, scabrate, psilate; colpi acute at ends, usually prominent and constricted at equator, apocolpium 4.0-9.0 μm wide, margo thickened; pori lolongate, circular, lalongate 3.0-12 μm long, costae 1.0-1.5 μm thick; oval, rhomboidal in equatorial view, semiangular, circular in polar view; polar axis 12-42 μm, equatorial axis 11-39 μm, prolate-spherical-oblate; flowering in Jun-Jul and Oct-Apr.
ref. *Camellia sinesis* (L.) O. Kuntze, 'Chanoki' (Oct-Nov): 4.

1a. Polar axis <15 μm, sexine scabrate-psilate ..... *Eurya japonica*
1b. Polar axis >25 μm, sexine reticulate
  2a. Margo thickened, colpi flat at equator, pori lolongate
    ..... *Stewartia pseudocamellia*
  2b. Margo not thickened, colpi equatorial prominent, pori cicular
    3a. Exine >2.5 μm thick ..... *Camellia japonica*
    3b. Exine <2.5 μm thick ..... *Camellia sinesis*

Eurya japonica Thunb. 'Hisakaki'
Exine 1.0 μm thick; sexine scabrate, psilate; colpi equatorial prominent, apocolpium

4.0 μm wide; pori lalongate 2.0-3.0 × 3.0-4.0 μm, costae 1.0 μm thick; oval in equatorial view, circular in polar view; polar axis 12-13-14 μm, equatorial axis 11-13-14 μm, P/E ratio 0.90-1.04-1.12; flowering in Mar-Apr. (*S. Hosomi 470*; Loc. K)

Camellia japonica L. 'Yabutsubaki'
Exine 3.3 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi prominent and constricted at equator, apocolpium 6.0-9.0 μm wide; pori circular 4.0-5.0 μm wide, costae 1.0 μm thick; oval, rhomboidal in equatorial view, semiangular in polar view; polar axis 32-35-42 μm, equatorial axis 31-36-39 μm, P/E ratio 0.89-0.99-1.14; flowering in Oct-Apr. (*S. Okamoto s.n.*; Loc. A)

Stewartia pseudocamellia Maxim. 'Natsutsubaki'
Exine 2.1 μm thick; sexine reticulate, lumina 0.5 μm wide; apocolpium 5.0-7.0 μm wide, margo 1.5-2.0 μm wide; pori lolongate 8.0-12 × 5.0-8.0 μm, costae 1.5 μm thick; oval in equatorial view, semiangular in polar view; polar axis 25-27-30 μm, equatorial axis 28-32-34 μm, P/E ratio 0.77-0.86-0.92; flowering in Jun-Jul. (*T. Takahashi and H. Murakami 1103*; Loc. F)

Thymelaeaceae (1 genus, 1 species)

Daphne miyabeana Makino 'Karasushikimi'
Periporate (15 porate) monad; exine 3.5-4.0 μm thick; sexine baculate, bacula 2.5 μm high; pori circular 1.5 μm, annuli absent; grains circular; grains 24-30-34 μm; flowering in Jun. (*M. Tagawa 1533*; Loc. K)

Tiliaceae (2 genera, 3 species)

Corchoropsis (1 species)

Corchoropsis tomentosa (Thunb.) Makino 'Karasunogoma'
Triporate monad; exine 2.0 μm thick; sexine echinate, echini 2.0-3.0 μm high; pori circular 7.0-9.0 μm, annuli thickened; grains circular, grains 41-54 μm, spherical; flowering in Aug-Sep. (ref. 4)

Tilia (2 species)
Tricolporate monad; exine 2.0-2.2 μm thick; sexine verrucate, reticulate; colpi short, narrow, margo thickened, with vestibulum; pori circular, lalongate, with costae oval in equatorial view, circular, semiangular in polar view; polar axis 16-23 μm, equatorial axis 27-36 μm, oblate; flowering in Jun-Jul.
ref. *Tilia kiusiana* Makino et Shirakawa, 'Heranoki' (Jul): 4.

Tilia japonica (Miq.) Simonkai 'Shinanoki'
Exine 2.2 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi 8.0 μm long, margo 4.0-5.0 μm thick; pori 4.0 μm wide, costae 5.0 μm thick; polar axis 20-21-23 μm, equatorial axis 27-31-33 μm, P/E ratio 0.61-0.69-0.82; flowering in Jun-Jul. (*G. Murata and S. Kitamura 3361*; Loc. S)

Trochodendraceae (1 genus, 1 species)

Trochodendron aralioides Sieb. et Zucc. 'Yamaguruma'
Tricolpate monad; exine 1.8 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide, smaller near colpi, muri simplicolumellate; colpi acute at ends, apocolpium 5.0-6.0 μm wide; oval in equatorial view, circular in polar view; polar axis 17-19-22 μm, equatorial axis 17-19-20 μm, P/E ratio 0.93-1.05-1.22; flowering in May-Jun. (*Y. Tateishi and J. Murata 4180*; Loc. A)

Typhaceae (1 genus, 1 species)

Typha latifolia L. 'Gama'
Monoporate, diporate tetrads; exine 1.5-2.5 μm thick; sexine reticulate, lumina 0.5 μm wide; pori circular 2.0-2.5 μm wide, annuli absent; linear, flat or irregular tetrads; grains 15-20-26 μm; flowering in Jun-Aug. (*H. Kanai and M. Morita 234*; Loc. S)

Ulmaceae (2 genera, 2 species)

Stephanoporate (4-5 porate) monad; exine 1.5-2.0 μm thick in proximal face, 1.0 μm thick in distal face; sexine rugulate; pori lolongate 2.0-4.0 μm long, annuli present; oval in equatorial view, angular in polar view; polar axis 24-30 μm, equatorial axis 26-40 μm, oblate; flowering in Apr-Jun.
ref. *Ulmus laciniata* (Trautv.) Mayr, 'Ohyou' (Apr-May): 4.

Zelkova serrata (Thunb.) Makino 'Keyaki'
Pori lolongate 4.0 × 2.0 μm wide, annuli 2.5 μm thick; polar axis 24-27-30 μm, equatorial axis 31-35-39 μm, P/E ratio 0.69-0.77-0.93; flowering in Apr. (*N. Kurosaki 12380*; Loc. F)

Umbelliferae (11 genera, 12 species)

Tricolporate monad; exine 1.5-2.0 μm thick; sexine baculate, bacula forming tectum on top, tectum scabrate, verrucate; colpi acute at ends, narrow, sometimes equatorial prominent, long, but hardly visible in polar view; pori lalongate, elliptic or H-shaped, 5.0-12 μm long, costae 0.5-2.0 μm thick; compressed, constricted oval, rhomboidal in equatorial view, circular, semiangular, angular in polar view; polar axis 17-35 μm, equatorial axis 10-25 μm, prolate; flowering in Apr-Nov.
ref. *Chamaele decumbens* (Thunb.) Makino, 'Sentousou' (Apr-May): 4; *Heracleum nipponicum* Kitag., 'Hanaudo' (May-Jun): 1; *Hydrocotyle maritima* Honda, 'Nochidome' (Jun-Sep): 4; *Oenanthe javanica* DC., 'Seri' (Jul-Aug): 4; *Osmorhiza aristata* (Thunb.) Rydb., 'Yabuninjin' (Apr-May): 3; *Torilis japonica* (Houtt.) DC., 'Yabujirami' (May-Jul): 4.

1a. Colpi equatorial prominent, angular in polar view
.....*Hydrocotyle maritima, Osmorhiza aristata*

1b. Colpi not equatorial prominent, circular, semiangular in polar view
2a. Constricted oval in equatorial view
3a. Polar axis >26 μm ..... *Angelica polymorpha*
3b. Polar axis <26 μm ..... *Torilis japonica*
2b. Compressed oval in equatorial vie
4a. Coarse, long, branched bacula at the polar ..... *Heracleum nipponicum*
4b. Bacula at the polar same as the other surface
5a. Pori elliptic ..... *Angelica polymorpha, A. pubescens, Anthriscus aemula, Chamaele decumbens, Oenanthe javanica*
5b. Pori H-shaped, margo thickened ..... *Sanicula chinensis*
2c. Oval in equatorial view
6a. Polar axis <24 μm ..... *Cryptotaenia japonica*
6b. Polar axis >24 μm
7a. Pori elliptic ..... *Spuriopimpinella niloensis*
7b. Pori H-shaped, margo thickened ..... *Sanicula chinensis*

Angelica polymorpha Maxim. 'Shiranesenkyuu'
Exine 1.5 μm thick; sexine verrucate; colpi 18 μm long, apocolpium 8.0-10 μm wide; pori 3.5 × 5.0-6.0 μm wide, elliptic, costae 2.0 μm thick; compressed, constricted oval in equatorial view, semiangular in polar view; polar axis 26-31-34 μm, equatorial axis 12-15-18 μm, P/E ratio 1.84-2.14-2.37; flowering in Sep-Nov. (*K. Tsuchiya 469*; Loc. K)

A. pubescens Maxim. 'Shishiudo'
Exine 1.5 μm thick; sexine verrucate; colpi 0.5 μm wide, apocolpium 7.0-8.0 μm wide; pori 3.0 × 5.0 μm wide, elliptic, costae 1.5 μm thick; compressed oval in equatorial view, semiangular in polar view; polar axis 27-31-33 μm, equatorial axis 12-14-15 μm, P/E ratio 1.91-2.22-2.50; flowering in Aug-Nov. (*Y. Araki 13822*; Loc. K)

Anthriscus aemula Schischkin 'Shaku'
Exine 1.5 μm thick; sexine verrucate; colpi 0.5 μm wide, apocolpium 8.0 μm wide; pori 3.0 × 5.0-6.0 μm, elliptic, costae 1.5 μm thick; compressed oval in equatorial view, semiangular, circular in polar view; polar axis 25-27-29 μm, equatorial axis 12-14-15 μm, P/E ratio 1.81-2.02-2.30; flowering in May-Jun. (*K. Iwatsuki 675*; Loc. A)

Cryptotaenia japonica Hassk. 'Mitsuba'
Exine 1.5-2.0 μm thick; sexine verrucate, scabrate; colpi 13 μm long, <0.5 μm wide, ragged; pori 1.5-2.0 × 5.0-6.0 μm, elliptic, costae 1.5-2.0 μm thick; compressed, constricted oval in equatorial view, circular in polar view; polar axis 17-19-22 μm, equatorial axis 13-16-19 μm, P/E ratio 1.07-1.24-1.46; flowering in Jun-Jul. (*N. Kinashi 469*; Loc. K)

Sanicula chinensis Bunge 'Umanomitsuba'
Exine 1.6 μm thick; sexine verrucate, scabrate; apocolpium 9.0-10 μm wide, margo thickened; pori H-shaped, 4.0-6.0 × 9.0-12 μm, costae 1.5 μm thick; compressed oval in equatorial view, circular in polar view; polar axis 27-32-35 μm, equatorial axis 16-19-22 μm, P/E ratio 1.52-1.71-1.86; flowering in Jul-Sep. (*Muroi s.n.*; Loc. A)

Spuriopimpinella nikoensis (Yabe ex Hisauti) Kitag. 'Hikagemitsuba'
Exine 1.5 μm thick; sexine verrucate, scabrate; colpi 18 μm long, <0.5 μm wide; pori 5.0-6.0 × 3.0-3.5 μm wide, elliptic, costae 0.5-1.0 μm thick; compressed, constricted oval in equatorial view, circular in polar view; polar axis 26-29-33 μm, equatorial axis 15-17-18 μm, P/E ratio 1.50-1.73-1.86; flowering in Jul-Sep. (*M. Tagawa 2070*; Loc. A)

Urticaceae (4 genera, 7 species)

Diporate, triporate monad; exine 0.5-1.0 μm thick; sexine verrucate, scabrate; pori circular 1.0 μm wide, annuli present; grains circular; grains 7-16 μm; flowering in May-Oct.
ref. *Boehmeria nipononivea* Koidz., 'Karamushi' (Jul-Sep): 4; *B. tricuspis* (Hance) Makino, 'Akaso' (Jul-Sep): 1; *Elatostema laetevirens* Makino, 'Yamatokihokori' (Aug-Oct): 1; *E. umbellatum* Blume, 'Uwabamisou' (Apr-Sep): 1; *Laportea bulbifera* (Sieb. et Zucc.) Wedd., 'Mukagoirakusa' (Aug-Sep): 4; *L. macrostachya* (Maxim.) Ohwi, 'Miyamairakusa' (Jul-Sep): 1; *Pilea mongolica* Wedd., 'Aomizu' (Jul-Oct): 1.

Valerianaceae (2 genera, 3 species)

Tricolpate monad; exine 3.0 μm thick; sexine echinate, echini 1.5-2.0 μm high, on shielded-shaped verrucae; colpi acute at ends, ragged, margo thickened; oval in equatorial view, semiangular in polar view; polar axis 27-50 μm, equatorial axis 30-53 μm, oblate-spherical; flowering in Apr-May and Aug-Oct.
ref. *Patrinia scabiosaefolia* Fisch., 'Ominaeshi' (Aug-Oct): 4; *Valeriana flaccidissima* Maxim., 'Tsurukanokosou' (Apr-May): 4.

1a. Polar axis >40 μm ..... *Patrinia villosa*
1b. Polar axis <40 μm ..... *Patrinia scabiosaefolia, Valeriana flaccidissima*

Patrinia villosa (Thunb.) Juss. 'Otokoeshi'
Apocolpium 20-24 μm wide, margo 2.0-3.0 μm wide; polar axis 40-43-50 μm, equatorial axis 43-49-53 μm, P/E ratio 0.76-0.89-1.09; flowering in Aug-Oct. (*Y. Araki 13675*; Loc. K)

Verbenaceae (3 gerena, 4 species)

Callicarpa (2 species)
Tricolpate monad; exine 2.0 μm thick; sexine reticulate, lumina 0.5 μm wide; colpi long, ragged, verrucate, margo thinned; oval in equatorial view, circular in polar view; polar axis 23-29 μm, equatorial axis 26-33 μm, spherical; flowering in Jun-Aug.
ref. *Callicarpa mollis* Sieb. et Zucc., 'Yabumurasaki' (Jun-Jul): 4.

Callicarpa japonica Thunb. 'Murasakishikibu'
Apocolpium 7.0-9.0 μm wide; polar axis 23-25-28 μm, equatorial axis 26-27-29 μm, P/E ratio 0.86-0.93-1.05; flowering in Jun-Aug. (*G. Murata 11419*; Loc. K)

Caryopteris (1 species)

Caryopteris divaricata (Sieb. et Zucc.) Maxim. 'Kariganesou'
Triporate monad; exine 4.0-5.0 μm thick; sexine echinate, echini 2.0-2.5 μm high; pori circular 6.0-9.0 μm wide, annuli thinned, 3.0 μm thick; polar axis 45-50-57 μm, equatorial axis 47-52-57 μm, P/E ratio 0.86-0.96-1.18 (n=18); flowering in Aug-Sep. (*M. Togashi 7754*; Loc. H)

Clerodendrum (1 species)

Clerodendrum trichotomum Thunb. 'Kusagi'
Tricolpate monad; exine 2.8 μm thick; sexine echinate, echini 1.5 μm high, 1.0 μm wide; colpi ragged, apocolpium 20-25 μm wide, margo thinned; oval in equatorial view, circular in polar view; polar axis 51-59-65 μm, equatorial axis 51-56-60 μm, P/E ratio 0.85-1.06-1.22; flowering in Aug-Sep. (*T. Takahashi 1021*; Loc. K)

Violaceae (1 genus, 8 species)

Tricolporate monad; exine 1.0-2.0 μm thick; sexine psilate, scabrate; colpi acute at ends, long, usually prominent and constricted at equator, margo sometimes prominent; pori ragged, variable in shape, 2.0-10 μm wide, with costae oval in equatorial view, circular in polar view; polar axis 17-49 μm, equatorial axis 18-44 μm, spherical-prolate; flowering in Apr-Jul.
ref. *Viola eizanensis* Makino, 'Eizansumire' (Apr-May): 4; *V. keiskei* Miq., 'Marubasumire, Kemarubasumire' (Apr-May): 1.

1a. Polar axis >40 μm ..... *Viola eizanensis*
1b. Polar axis 25-40 μm
  2a. Apocolpium >6.0 μm wide
    3a. Costae >1.5 μm thick, colpi constricted at equator ..... *V. vaginata*
    3b. Costae <1.5 μm thick, colpi not constricted at equator ..... *V. mandshurica*
  2b. Apocolpium <6.0 μm wide
    4a. Colpi prominent at equator ..... *V. verecunda, V. violacea*
    4b. Colpi not prominent at equator ..... *V. mandshurica*
1c. Polar axis <25 μm
  5a. Apocolpium <6.0 μm wide ..... *V. kusanoana, V. verecunda, V. violacea*
  5b. Apocolpium >6.0 μm wide ..... *V. grypoceras, V. kusanoana*

Viola grypoceras A. Gray 'Tachitsubosumire'
Exine 1.0 μm thick; colpi prominent and constricted at equator, apocolpium 6.0-8.0 μm wide; pori ragged, circular 3.5 μm wide; polar axis 17-21-25 μm, equatorial axis 20-22-25 μm, P/E ratio 0.84-0.96-1.25; flowering in Apr-May. (*K. Ueda and E. Kinoshita 545*; Loc. A)

V. kusanoana Makino 'Ootachitsubosumire'
Exine 1.1-1.3 μm thick; colpi constricted at equator, apocolpium 5.0-7.0 μm wide; pori ragged, variable in shape, 2.0-5.0 μm wide, costae 1.5-2.5 μm thick; polar axis 20-23-25 μm, equatorial axis 18-21-25 μm, P/E ratio 0.89-1.11-1.27; flowering in Apr-May. (*H. Nagamasu 1463*; Loc. A)

V. mandshurica W. Becker 'Sumire'
Exine 1.3 μm thick; apocolpium 4.0-8.0 μm wide; pori ragged, variable in shape, 4.0-10 μm wide, costae 1.0 μm thick; polar axis 25-29-34 μm, equatorial axis 25-31-37 μm, P/E ratio 0.69-0.96-1.35; flowering in Apr-May. (*G. Koidzumi s.n.*; Loc. K)

V. vaginata Maxim. 'Sumiresaishin'
Exine 1.5-2.0 μm thick; colpi constricted at equator, apocolpium 7.0-8.0 μm wide; pori ragged, lolongate 4.0 × 3.0 μm wide, costae 1.5-2.0 μm thick; polar axis 25-30-35 μm, equatorial axis 25-28-32 μm, P/E ratio 0.95-1.08-1.40; flowering in Apr-May. (*K. Iwatsuki 704*; Loc. A)

V. verecunda A. Gray 'Tsubosumire'
Exine 1.5 μm thick; colpi prominent at equator, apocolpium 3.0-5.0 μm wide; pori ragged, variable in shape 3.0-4.0 μm wide; polar axis 20-25-27 μm, equatorial axis 22-27-30 μm, P/E ratio 0.84-0.92-1.00 (n=19); flowering in Apr-May. (*K. Ueda et al. 514*; Loc. A)

V. violacea Makino 'Shihaisumire'
Exine 1.3 μm thick; colpi prominent at equator, apocolpium 3.0-6.0 μm wide; pori ragged, variable in shape, 3.0-7.0 μm wide, costae 1.0-2.0 μm thick; polar axis 21-25-30 μm, equatorial axis 20-25-29 μm, P/E ratio 0.81-0.99-1.19; flowering in Apr-May. (*H. Nagamasu 4461*; Loc. A)

Vitaceae (3 genera, 5 species)

Tricolporate monad; exine 1.5-2.5 μm thick; sexine reticulate, lumina 0.5-1.5 μm wide; colpi acute at ends, long, margo thickened; pori lalongate 5.0-7.0 μm long, or circular 1.8 μm wide, with costae oval, compressed rhomboidal in equatorial view, circular, angular in polar view; polar axis 17-43 μm, equatorial axis 14-33 μm, prolate, spherical; flowering in May-Aug.
ref. *Vitis coignetiae* Pulliat ex Planch., 'Yamabudou' (Jun): 4; *V. flexuosa* Thunb., 'Sankakuduru' (May-Jun): 4; *V. thunbergii* Sieb. et Zucc., 'Ebiduru' (May-Aug): 4.

1a. Polar axis <20 μm, angular in polar view ..... *Vitis flexuosa*
1b. Polar axis 20-30 μm, angular in polar view ..... *Vitis coignetiae, V. thunbergii*
1c. Polar axis >30 μm, circular in polar view
2a. Pori slit-like, 7.0 x <0.5 μm wide ..... *Ampelopsis brevipedunculata*
2b. Pori equatorial apiculate, 5.0-6.0 x 3.0-4.0 μm wide
..... *Parthenocissus tricuspidata*

Ampelopsis brevipedunculata (Maxim.) Trautv. 'Nobudou'
Exine 2.5 μm thick; lumina 0.5-1.0 μm wide; apocolpium 8.0-10 μm wide; pori lalongate 7.0 × <0.5 μm, slit like, costae 1.5 μm thick; oval in equatorial view, circular in polar view; polar axis 36-38-40 μm, equatorial axis 27-31-33 μm, P/E ratio 1.15-1.23-1.39; flowering in Jul-Aug. (*N. Nagai 25215*; Loc. K)

Parthenocissus tricuspidata (Sieb. et Zucc.) Planch. 'Tsuta'

Exine 2.0 μm thick; lumina 0.5-1.5 μm wide, smaller near colpi, muri simplicolumellate; apocolpium 6.0-8.0 μm wide; pori lalongate, apiculate at both lateral ends, 5.0-6.0 × 3.0-4.0 μm, costae 1.0-1.5 μm thick; oval in equatorial view, circular in polar view; polar axis 33-37-43 μm, equatorial axis 27-29-33 μm, P/E ratio 1.11-1.27-1.48; flowering in Jun-Jul. (*A. Nitta 12435*; Loc. H)

Zingiberaceae (1 genus, 1 species)

Zingiber mioga (Thunb.) Roscoe 'Myouga'

Damaged by acetolysis; inaperturate monad; exine 0.5-1.0 μm thick; sexine striate, striae 1.0-2.0 μm wide; grains elliptic 90-110-130 × 50-70-80 μm; flowering in Aug-Oct. (*S. Tsugaru and G. Murata 16929*; Loc. I)

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Glossary

acetolysis: a process of acetylation for removing the organic matter of pollen except sporopollenin.

angular: a shape of grain in polar view, outline between apertures is straight, apertures at apex.

annulus/annuli : thicker or thinner part of exine surrounding a pore.

aperture: an opening or a thinner part of exine for germination of pollen tube and regulation of pollen volume with changing of water content.

apocolpium: the polar area beyond the ends of colpi, the measurements are given for the distance between ends of two colpi.

baculate, baculum/bacula: with sculpting element like $>1\,\mu$m rod, height longer than diameter, and showing uniform diameter from base to top.

brochus/brochi: an unit of reticulum measured between center of muri.

caudicle: a connective element of a pollinarium extending from the base of pollinium.

circular: shape of grain and pore round without apex, longer diameter <1.33 times of shorter one.

clavate, clava/clavae: with sculpting element like $>1\,\mu$m rod, and top end wider than the base.

colporus/colpori: aperture complex of colpus and pore.

colpus/colpi: aperture like furrow, length >2 times of width.

compressed: a shape of grain in equatorial view, outline near the equator straight.

constricted: a shape of grain in equatorial view, outline near the equator concave.

corpusculum: an anchor-like object attaching to pollinator.

costa/costae : a thicker edge of endexine surrounding a pore, visible in equatorial view.

depressed: a shape of grain in equatorial view, outline near the poles straight.

echinate, echinus/echini: with sculpting element like $>1\,\mu$m spine, the top end pointed.

ektexine: outer part of exine.

elliptic : shape round without apex, longer diameter >1.33 times of shorter one.

endexine: inner layer of exine under the foot layer.
equator: a line separating the proximal and distal hemispheres.
equatorial axis: the axis perpendicular to the polar axis, but the mesurements given for the distance between two farthest points on the equator.
exine: outer layer of grain, enclosing intine and cytoplasm, containing sporopollenin and tolerant to acetolysis.
gemmate, gemma/gemmae: with sculpting element like $>1\,\mu m$ rod, diameter larger than height and the base constricted.
glandula: an object with sticky part at the base of pollinarium, attaching to pollinator.
heterobrochate: with brochi different in size.
heteropolar: shape of proximal and distal hemispheres different.
homobrochate: with brochi uniform in size.
isopolar: shape of proximal and distal hemispheres same.
lalongate: pore transversely elongate, equatorial diameter >1.33 times of polar diameter.
lobate: a shape of grain in polar view, outline between apertures concave, apertures at apex.
lolongate: pore longitudinally elongate, equatorial diameter >1.33 times of polar diameter.
lumen/lumina: space enclosed by muri in a reticulum.
margo: thicker or thinner part along colpus.
murus/muri: ridge separating lumen in a reticulum.
oblate: with the length of equatorial axis >1.33 times of that of polar axis, P/E ratio <0.75.
P/E ratio: a ratio of the length of polar axis to that of equatorial axis.
pole: inner (proximal) and outer (distal) extremities of the grain in the tetrahedral arrangement of microspores.
polar axis: axis between proximal and distal poles.
pollinarium/pollinaria: consisting of pollinia, associated connectives and structure for fastening to a substrate or pollinator.
pollinium/pollinia: sac of agglutinated pollen grains, a part of pollinarium.
pore/pori: a round aperture on the surface of exine, the longer axis shorter than twice of the shorter one; sometimes used for an endoaperture of various shapes, of the pollen grains with compound apertures.
prolate: with the length of polar axis >1.33 times of that of equatorial axis, P/E ratio <1.33.
psilate: sculpting element absent or surface relatively smooth.
reticulate: sculpting with a network of anastomosing ridges, enclosing small, frequently regular spaces.
rhomboidal: a shape of grain in equatorial view, outline of lozenge.
rugulate, rugula/rugular: with sculpting element like elongate ridges, length at least twice the width, irregularly distributed.
scabrate: with minute sculpting elements, no dimension of which reaches $1\,\mu m$.
semiangular: a shape of grain in polar view intermediate between angular and circular, the outline between apertures convex.
sexine: outer part of exine containing tectum and columellae, displaying sculpture.
spherical: with the length of longer axis >1.33 times of that of shorter axis, P/E ratio >0.75 and <1.33.
striate, stria/striae: with sculpting element like elongate parallel ridges, length >2 times of the width.
tectum: a more or less continuous roof formed outer part of ektexine, supported by columellae.
valla/vallae: ridges in striate or rugulate sculpting.
verrucate, verruca/verrucae: with sculpting element like $>1\,\mu m$ rod, diameter larger than height, not constricted at base.
vestibulum: a compartment between endexine and ektexine around pore.

zonorate: with series of pori forming a continuous equatorial ring crossing colpi.

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Appendix

The following species in Watanabe (1970) are not treated in this work.

Aceraceae
- Acer micranthum
- Acer nikoense
- Acer tenuifolium

Asclepiadaceae
- Cynanchum caudatum
- Cynanchum paniculatum
- Metaplexis japonica
- Tylophora aristolochioides

Boraginaceae
- Trigonotis brevipes

Caryophyllaceae
- Silene firma
- Stellaria uchiyamana

Celastraceae
- Euonymus lanceolatus

Compositae
- Cacalia peltifolia
- Carpesium glossophyllum
- Cirsium dipsacolepis
- Cirsium longepedunculatum
- Cirsium microspicatum
- Cirsium yezoense
- Pertya rigidula
- Rhynchospermum verticillatum
- Saussurea pulchella
- Senecio pierotii

Convolvulaceae
- Calystegia sepium

Crassulaceae
- Hylotelephium sordidum
- Sedum aizoon var. floribundum

Cruciferae
- Arabis gemmifera

Cyperaceae
- Carex blepharicarpa
- Carex breviculmis
- Carex conica
- Carex curvicollis
- Carex dolichostachya var. glaberrima
- Carex fedia var. miyabei
- Carex incisa
- Carex insaniae
- Carex insaniae var. papillaticulmis
- Carex ischnostachya
- Carex japonica
- Carex kiotensis
- Carex maximowiczii
- Carex mollicula
- Carex morrowii
- Carex morrowii var. temnolepis
- Carex olivacea var. angustior
- Carex parciflora var. macroglossa
- Carex persistens
- Carex shimidzensis
- Carex siderosticta
- Carex thunbergii
- Cyperus amuricus
- Cyperus brevifolius var. leiolepis
- Cyperus difformis
- Cyperus flaccidus
- Cyperus iria
- Cyperus microiria
- Cyperus orthostachyus
- Eleocharis congesta
- Eleocharis wichurae
- Fimbristylis milliacea
- Fimbristylis subbispicata
- Lipocarpha microcephala
- Scirpus juncoides
- Scirpus tabernaemontani
- Scirpus triangulatus
- Scirpus wichurae

Eriocaulaceae
- Eriocaulon robustius

Graminae
- Agropyron tsukushiense var. transiens
- Agrostis alba
- Agrostis clavata var. nukabo
- Alopecurus aequalis
- Arthraxon hispidus
- Arundinella hirta
- Brachypodium sylvaticum
- Bromus pauciflorus
- Brylkinia caudata
- Calamagrostis arundinacea
- Calamagrostis epigeios
- Calamagrostis hakonensis
- Calamagrostis longiseta
- Diarrhena japonica
- Digitaria ciliaris
- Digitaria violascens
- Eccoilopus cotulifer
- Echinochloa crus-galli var. caudata
- Eragrostis ferruginea
- Eragrostis multicaulis
- Festuca parvigluma
- Hierochloe odorata var. pubescens
- Isachne globosa
- Leersia sayanuka
- Lophatherum gracile
- Melica nutans
- Microstegium japonicum
- Microstegium nudum

Microstegium vimineum
Milium effusum
Miscanthus sinensis
Miscanthus tinctorius
Muhlenbergia curviaristata
Muhlenbergia hakonensis
Muhlengergia longistolon
Oplismenus undulatifolius
Panicum bisulcatum
Paspalum thunbergii
Pennisetum alopecuroides
Phalaris arundinacea
Phragmites japonica
Poa acroleuca
Poa radula
Poa sphondylodes
Sacciolepis indica var. oryzetorum
Sasa kurilensis
Setaria chondrachne
Setaria glauca
Setaria viridis
Trisetum bifidum
Zoysia japonica

Juncaceae
Juncus diastrophanthus
Juncus effusus var. decipiens
Juncus leschenaultii

Labiatae
Ajuga yezoensis
Clinopodium multicaule
Isodon japonica

Lauraceae
Lindera erythrocarpa
Lindera glauca
Lindera obtusiloba
Lindera triloba
Lindera umbellata
Lindera umbellata var. membranacea
Neolitsea sericea

Leguminosae
Cladrastis platycarpa
Cladrastis sikokiana
Maackia floribunda

Lentibulariaceae
Utricularia multispinosa

Liliaceae
Hosta longipes

Lythraceae
Rotala pusilla

Menispermaceae
Menispermum dauricum

Oleaceae
Fraxinus longicuspis

Orchidaceae
Amitostigma keiskei
Calanthe discolor
Calanthe reflexa
Calanthe tricarinata
Cephalanthera falcata
Cremastra appendiculata
Cremastra unguiculata
Cymbidium goeringii
Epitactis thunbergii
Galeola septentrionalis
Gastrodia elata
Goodyera foliosa
Goodyera pendula
Goodyera schlechtendaliana
Gymnadenia camtschatica
Liparis krameri
Liparis kumokiri
Orchis chidori
Oreorchis patens
Plantathera minor
Platanthera florenti
Platanthera hologlottis
Platanthera mandarinorum
Platanthera sachalinensis
Pogonia minor
Spiranthes sinensis
Yoania japonica

Orobanchaceae
Phacellanthus tubiflorus

Polygonaceae
Persicaria sieboldi
Persicaria taquetii
Persicaria viscofera
Persicaria yokusaiana

Primuraceae
Lysimachia acroadenia

Ranunculaceae
Dichocarpum ohwianum

Rhamnaceae
Berchemia pauciflora

Rosaceae
Rosa fujisanensis
Rubus pectinellus
Rubus phoenicolasius
Rubus sumatranus

Rubiaceae
Galium kikumugura
Galium paradoxum

Salicaceae
Salix alopochroa

Saxifragaceae
Chrysosplenium fauriei
Chrysosplenium kamtschaticum
Chrysosplenium tosaense

Scrophuraliaceae
Deinostema violaceum
Dopatrium junceum
Veronica melissaefolia

Solanaceae
Physaliastrum savatieri
Ulmaceae
Celtis jessoensis
Umbelliferae
Angelica matsumurae
Hydrocotyle sibthorpioides
Hydrocotyle yabei
Urticaceae
Pilea japonica
Pilea petiolaris
Violaceae
Viola brevistipulata
Viola collina
Viola hondoensis
Vitaceae
Vitis saccharifera

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